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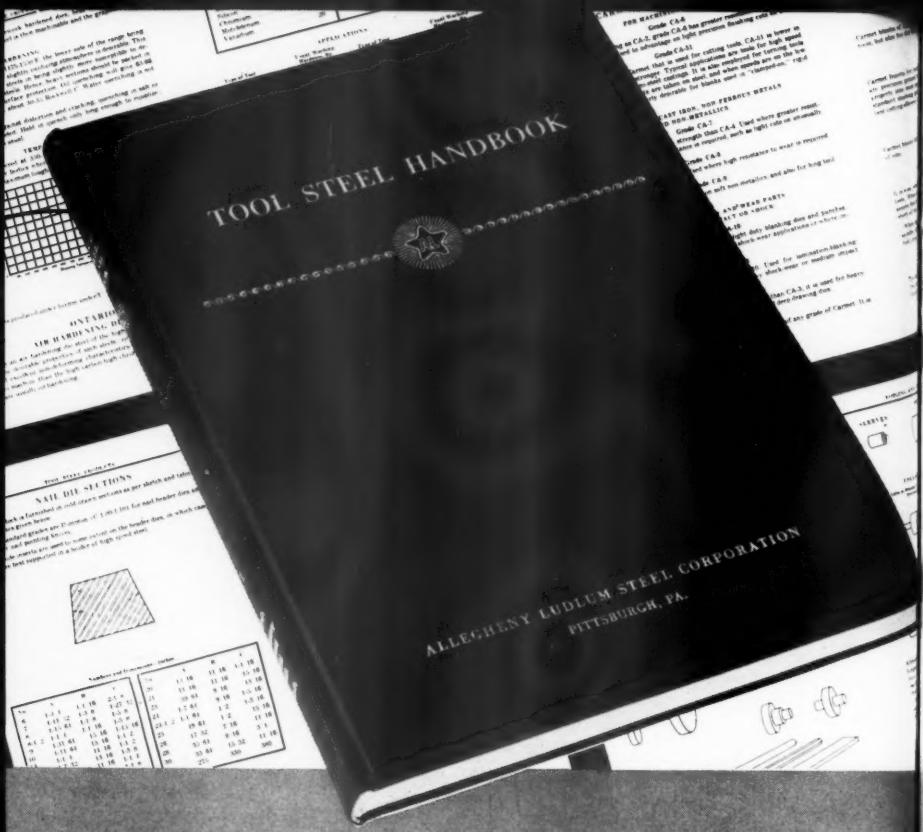

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1371

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"Controlled-Air-Power for Faster, Safer and Better Production"

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The Magazine of

TOOLING and PRODUCTION

TOOL & DIE JOURNAL

1975 Lee Road • CLEVELAND 18, OHIO
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...shear 750,000 lbs. of steel every 22 days

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Freedom from shut downs, long knife wear, efficient, accurate gauging and general ease of control all contribute to this steady production.

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A 6-foot, 8-foot and a 10-foot Cincinnati Shear make up the battery.

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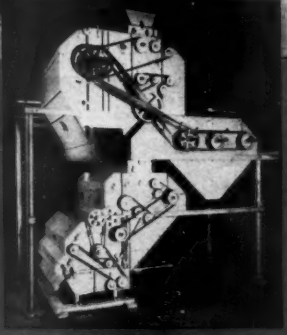

A John E. Mitchell Company combination machine used to soften glass. Photos courtesy of the John E. Mitchell Company.

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51-53

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RECONDITIONING TO *New Tool* PERFORMANCE AT A FRACTION OF *New Tool* COST

HIGH SPEED *We Regrind* MIDGET MILLS • ROTARY FILES BURRS • COUNTERSINKS • COUNTERBORES END MILLS • MILLING CUTTERS • REAMERS **CARBIDE**

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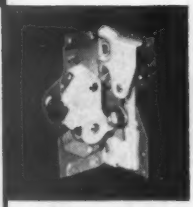

VALUE at a FAST PACE

In Jackson, Michigan, the Hancock Mfg. Co., producers of automobile hardware, like the way this bank of Clearing presses stick to their jobs. Long experience with high-volume, high-tempo, production runs has made Hancock a pretty good judge of press stamina.

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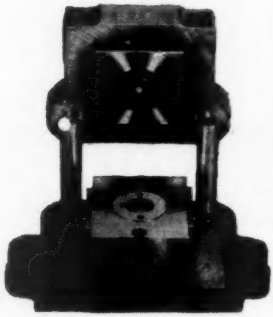

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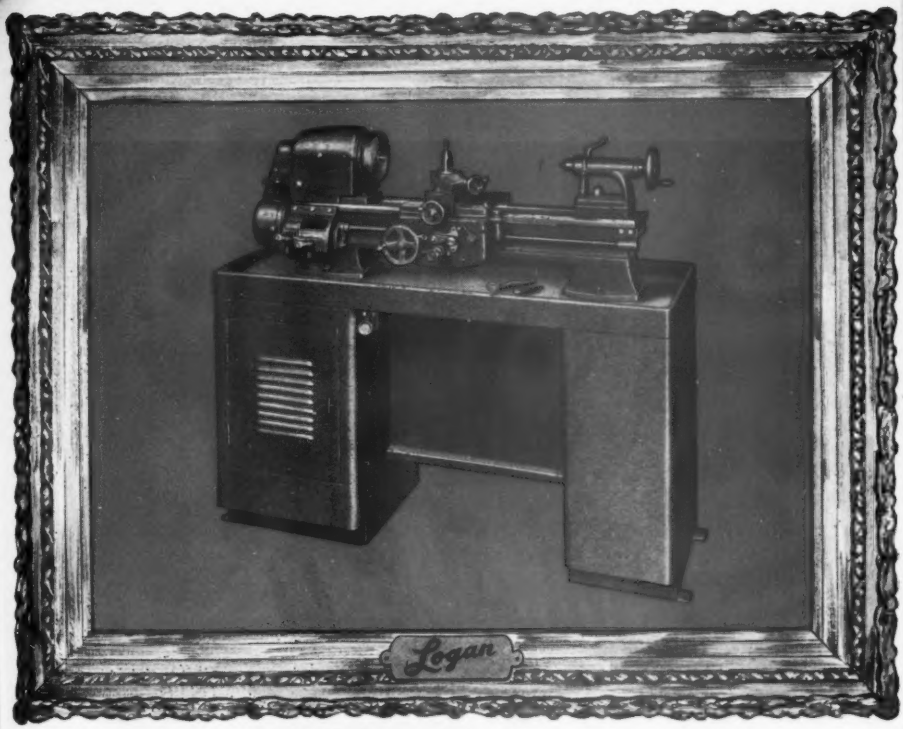

RARE PICTURE:

Logan No. 953—Quick Change Gear Lathe, 11" Swing, 1" Collet Capacity, 1⅜" Spindle Hole

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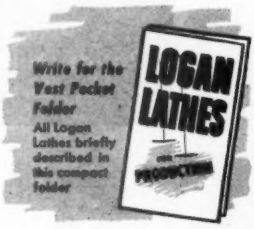
Look down the production lines of metal-working industry, through tool rooms, and large and small machine shops . . . you'll find the workhorse schedules assigned to Logan Lathes.

Logan Lathes keep busy because they do many jobs well. They are quickly and easily set up for any type of lathe operation, a heavy cut, a tool room precision job, a high speed production run, or large volume second operation work. Their sustained accuracy and rugged durability keep production going at top efficiency. With 11" swing and 1" collet capacity they handle a big percentage of any shop's work. Rugged as well as accurate, they are lathes you can depend on, not only the first year, but for years after. Remember, too, that no other lathe of comparable specifications can match the Logan in economy.



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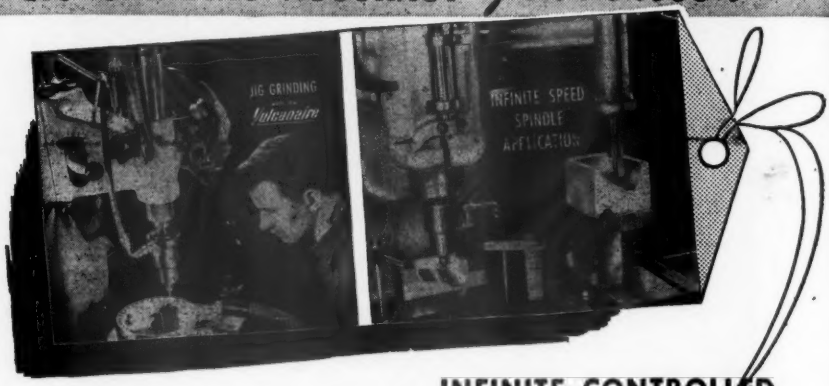

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Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

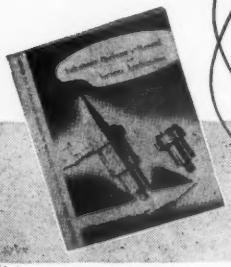
*Dependably accurate to "tenths"

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 8 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.



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...the fastest, cheapest production method!

- ***Work immersed in batches*** ... 5, 20 or 100 assemblies in each batch.
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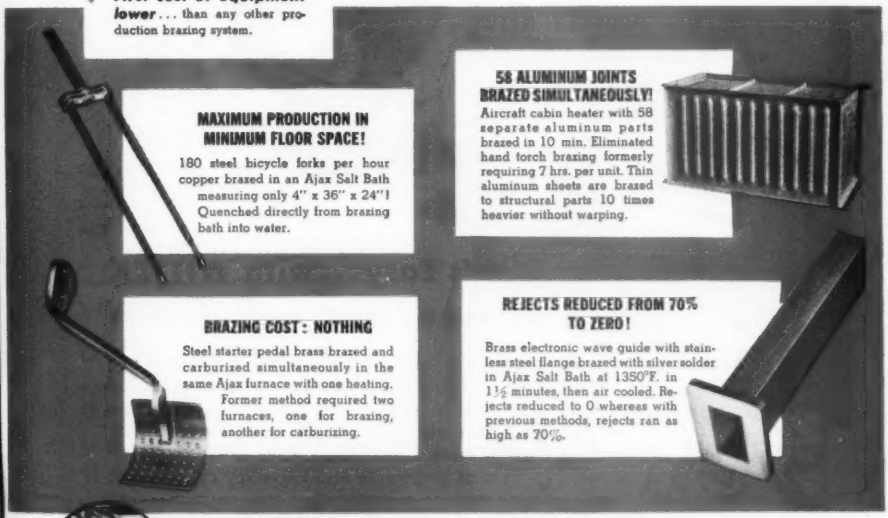
In cases where a brazed assembly must also be hardened or carburized, the salt bath offers special economies because the brazing and hardening can be done simultaneously in a single heating operation.

Let us braze a job batch of your parts in our Metallurgical Service Laboratory. See how much faster your work can be handled, how much your product can be improved. Write for details.



MAXIMUM PRODUCTION IN MINIMUM FLOOR SPACE!

180 steel bicycle forks per hour copper brazed in an Ajax Salt Bath measuring only 4" x 36" x 24"! Quenched directly from brazing bath into water.

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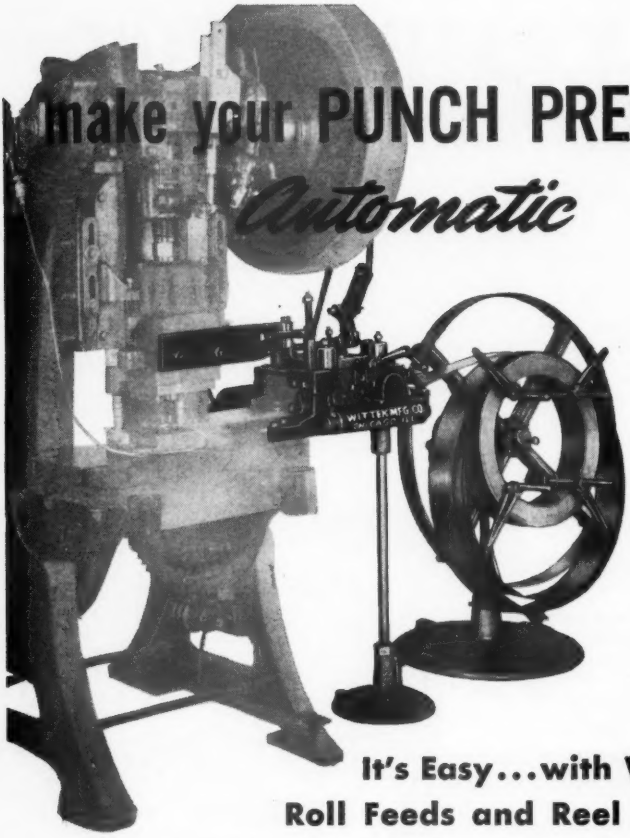
make your PUNCH PRESSES *Automatic*



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Wittek Reel Stands facilitate handling coiled stock.

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Automatic ROLL FEEDS AND REEL STANDS

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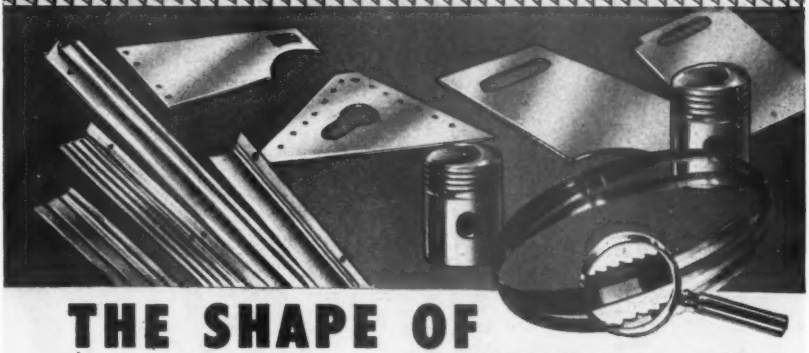
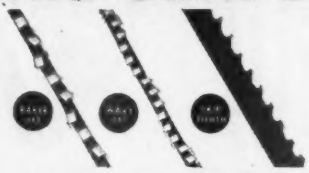


THE SHAPE OF THINGS TO CUT



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CONVENTIONAL RAKER AND WAVY SET . . . for all general purpose cutting, on all contour and cut-off band saw machines.

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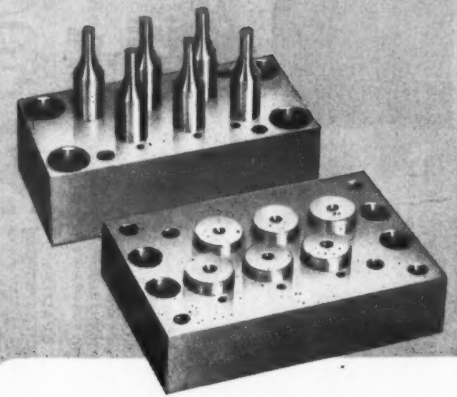
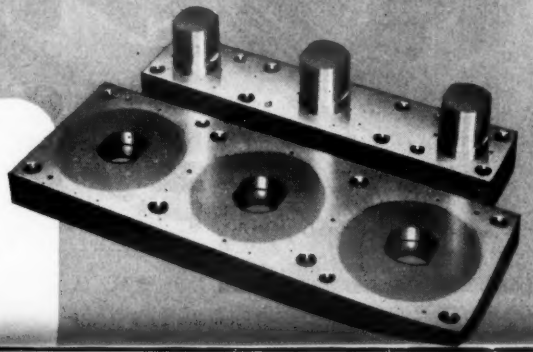


Each special R-B retainer plate is made from tool steel and is precision ground after hardening. They will hold as many interchangeable R-B punches and dies as your operation requires. Ball locks are built into these special plates at designated locations providing the same radial and vertical locking feature found in standard R-B retainers.

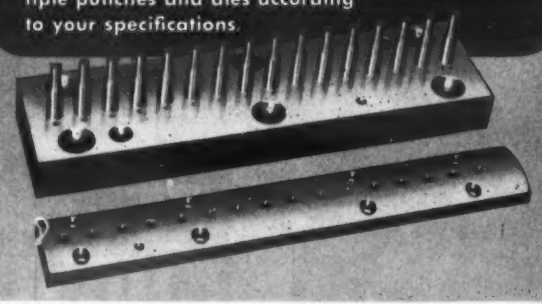


SPECIAL RETAINER PLATES

You can gain all the advantages of R-B standard

The use of multiple hole retainer plates

You can gain all the advantages of R-B standard punches and dies on those jobs where small center to center hole spacing in work precludes the use of standard individual R-B retainer plates. For, R-B will make special retainer plates holding multiple punches and dies according to your specifications.



The use of multiple hole retainer plates saves you skilled man hours in die construction and maintenance. Result—more work completed each day by your skilled men and increased production profits for you.

Any shape, size, or number of punches and die buttons can be incorporated in the designing of your R-B special retainer plates. For the full story—on how you can "Slash Skilled Man Hours" in die design, construction and operation—ask for 52 page R-B catalog.

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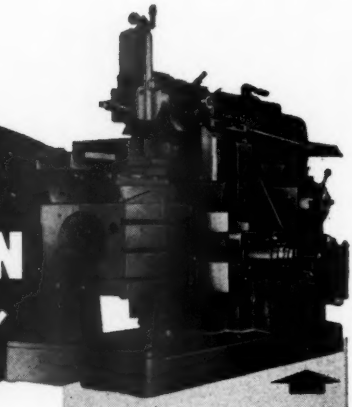
HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES • ALLITE DIES CAST OF ZINC ALLOY • JIGS • FIXTURES

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

"TODAY...IT'S PRODUCTION THAT COUNTS"

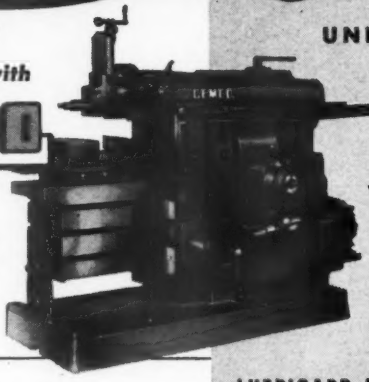


... BEAT COSTLY OBSOLESCENCE *with*

GEMCO

PRECISION SHAPERS

SAVE TIME...
SAVE LABOR...



UNIVERSAL TYPE

For tool and die work and general machine shop work requiring frequent changes and angular settings. Available in sizes from 16" to 36" stroke.

LUBRIGARD PROTECTED

PRODUCTION TYPE

For general machine shop use and heavy production work. Available in sizes from 16" to 36" stroke.

LUBRIGARD PROTECTED

• PLAIN TYPE SHAPERS
...available only in sizes 16" and 20" stroke

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•
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PRECISION MACHINERY SINCE 1917

Want a perfect fit?

Send for Catalog and name of nearest Distributor

American Drill Jig bushings are precision ground to give you a *perfect fit* for drill and jig, whether you order a standard size from complete stocks at our many distributors throughout the U.S. and Canada—or special made-to-order sizes to your specifications. Close tolerances up to .0001". Concentric ground lead for perfect alignment. Keep production rolling in high gear, ask for American Drill Jig Bushings *FOR A PERFECT FIT.*

SPECIALIZING ONLY IN DRILL JIG BUSHINGS

American DRILL BUSHING CO.

5107 PACIFIC BOULEVARD, LOS ANGELES 58, CALIFORNIA

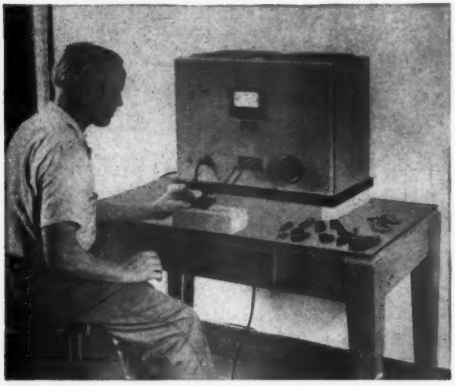
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

LEPEL offers a New LOW COST High Frequency HEATING UNIT

AT A PRICE SO LOW THAT NO MACHINE SHOP, TOOL ROOM OR LABORATORY CAN AFFORD TO BE WITHOUT IT!

DOES ALL THESE JOBS
Faster, Better and Cheaper
BRAZING, SOLDERING
HARDENING, ANNEALING
DRAWING AND
MELTING

- **SMALL and COMPACT**
  Conveniently operated on bench or table — no mounting necessary.
- **ECONOMICAL OPERATION**
  No special power installation required. Operates on 110 volts, 60 or 50 cycle line at unity power factor.
- **FULLY GUARANTEED**
  Guaranteed for continuous duty cycle and stated performance.
- **LOW COST** $870 f.o.b. factory
  Complete unit with line connection and load coil



Unit illustrated brazing carbide tips to cutting tools. Shanks up to 1½" square can be satisfactorily brazed.

WILL HEAT TO 1500° F.

⅛" steel rod 1" length in approx.	1 second
¼" " " " " "	3 seconds
½" " " " " "	15 seconds
1" " " " " "	60 seconds

Will melt 4 ounces of brass or steel in 4 minutes.
Equally well suited for heating of non-ferrous metals.

Write for Lepel Catalog TD-3

FRONT SIDE OF TOOLING AREA 1¼-SIX

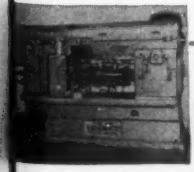
REAR SIDE OF TOOLING AREA 1¼-SIX

THE IMPORTANT REQUIREMENT

All brands of multiple spindle bar automatics offer value or they would not be on the market. If it were possible to engineer and incorporate the superior qualities of all into one machine, certain features would still be considered more important than others in accordance with the individual buyer's requirements.

But there is one essential quality required of all brands—regardless of the job. It is *dependable, low cost performance!* CONOMATIC users know well its benefits. But you don't have to be a user to know about this feature, or any other feature, of the CONOMATIC. Just write, wire, or phone for the information. There is no obligation.

…ous drilling without …ndle stopping …e of many CONO-…IC innovations which …e one of the machine's unexcelled accommodation to tools …ork. But any such facility that saves secondary handling is …able only because of the more important "built in" qualities …keep the machine running.



A Comparison of ALL Automatics is in favor of Cone

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

You're INVITED TO

SEE THE PERFORMANCE OF..

AUTOMATICS	Swiss Automatic Screw Machines
LATHES	Turret • Bench • Precision • Micro Finish
BORING MILLS	Vertical Boring & Turning • Vertical Turret Lathe
DRILLS	Radial • Large & Small Uprights • Multi-Spindle
MILLERS	Universal • Horizontal • Vertical
GRINDERS	Cylindrical • Internal & Face • Gear
PANTOGRAPH MACHINES	Universal Pantograph Die Sinkers 2 & 3 Dimensional Engravers & Copy Millers

COLD SAWS	PINION CUTTING MACHINES	BURNISHING MACHINES	SAW SHARPENING MACHINES
CAM SHAPERS	LAPPING MACHINES	COIL WINDING MACHINES	UNIVERSAL TOOL & CUTTER GRINDERS
INSPECTION EQUIPMENT	MECHANICAL & ELECTRICAL COMPARATORS	TOOL MAKER'S MICROSCOPES
MULTI-DIMENSIONAL INSPECTION MACHINES	BALANCING MACHINES	VICKERS TYPE HARDNESS TESTERS

...ONAL
...RESENTATIVES
...FOR THESE LEADING
...EUROPEAN FIRMS

SWISS
Andre Bechler
Isoma
Microfil
Micro-Moog
Oerlikon Machine Tool Works
Reishauer Tool Works
Rigid-Rorschach
Sallaz Brothers
Fritz Studer

GERMAN
Alzmetall
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Fortuna Works
Froriep
Hermann Kolb
Pittler
Karl Schaak
Gustav Wagner
Peter Wolters
Wanderer Works

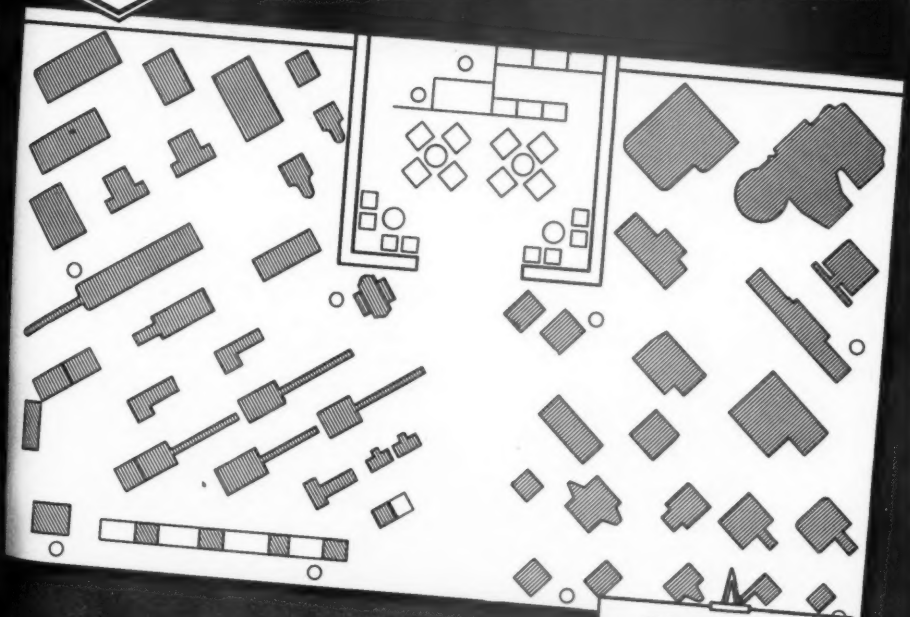
SWEDISH
Malcus Holmquist

ENGLISH
Sigma Instrument Co.

BOOTH 1750

A.S.T.E. INDUSTRIAL EXPOSITION

COSA **MACHINE TOOL EXHIBIT**



Precision Production and Tool Room Equipment from Small Bench Lathes to Large Boring Mills

CATALOGS

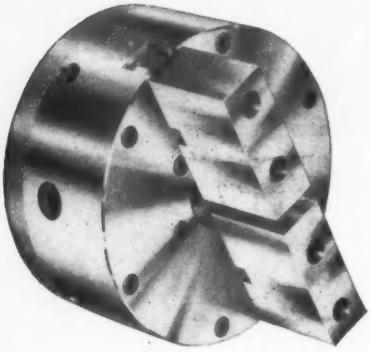
Write for catalogs on the specific equipment you need — for the production line, tool room or inspection department.

COSA CORPORATION

405 Lexington Ave., New York 17

CHRYSLER BUILDING

Buck ADJUST-TRU **CHUCKS**



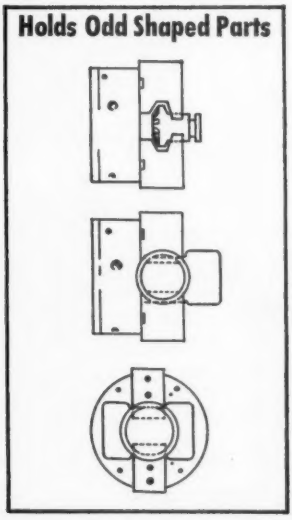
NEW 2-JAW AVIATION CHUCK

THIS is the slickest way ever devised to hold irregular shaped parts for duplicate machining operations within *.0005 precision.*

The master jaws have *soft* top jaws which you machine to hold your specific work, then harden if you wish. That's not new. But the way the Adjust-Tru principle saves time on accurate rechucking is truly amazing. The jaws move in and out simultaneously to grip the work with a *single-pinion* action — just like any scroll chuck.

You make but one adjustment for precision when you start your run — then re-chuck with scroll chuck speed without further adjustment.

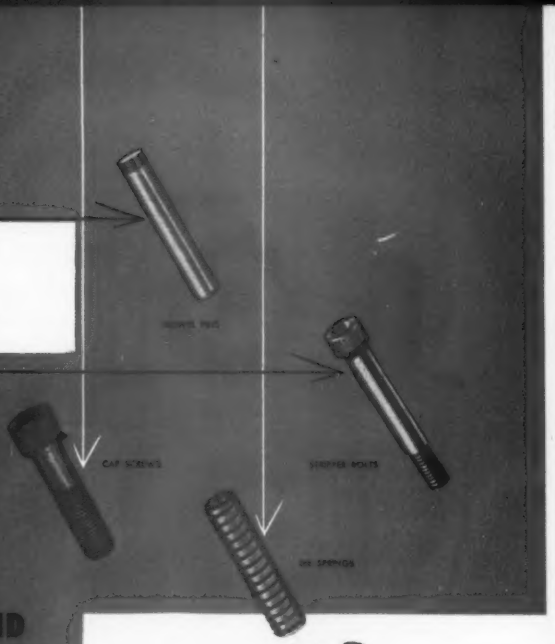
Ask for a catalog with full details.



SEE US AT ASTE SHOW
BOOTH 153

BUCK TOOL COMPANY
318 Schippers Lane
KALAMAZOO, MICHIGAN

A Good, Fast Start for Your Tooling Program

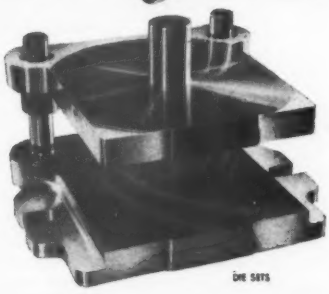


DANLY DIE SETS AND DIEMAKERS' SUPPLIES

When you start your tooling program by specifying DANLY Die Sets and Diemakers' Supplies, you are sure of . . .

1. *Reliable Danly precision—a standard of quality for more than 28 years.*
2. *Prompt delivery—completely stocked Danly branch assembly plants are located in nearly every major tool making center.*

That's why Danly is the first choice of diemakers everywhere!



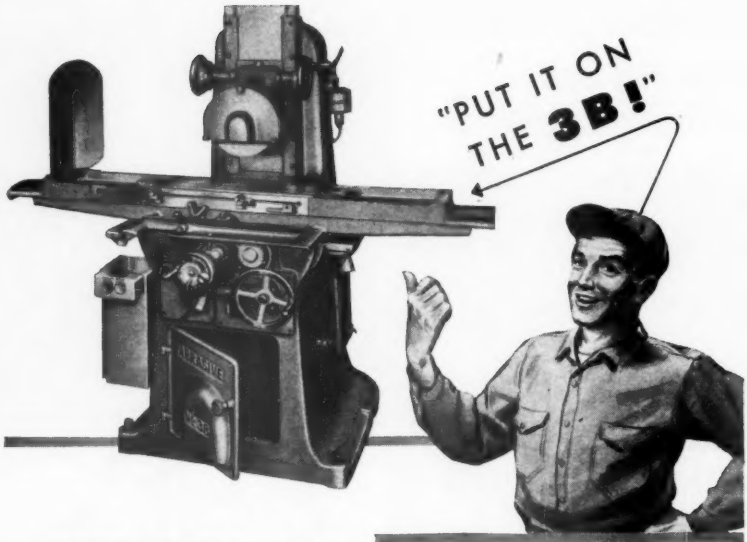
Send for this free Booklet today!

See how Danly's complete line will help you save tooling time.

WE'LL BE LOOKING FOR YOU AT THE A.S.T.E. SHOW
CHICAGO, MARCH 17-19—BOOTH No. 1610
(just inside the door)

DANLY

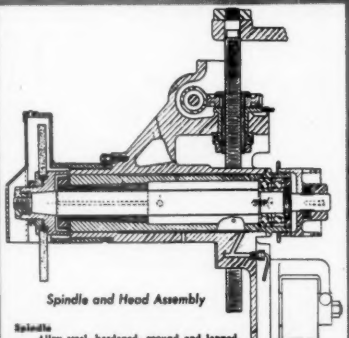
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois



That's the production byword in plants everywhere... put the job on the Abrasive No. 3B Surface Grinder for high output and high accuracy. Defense production parts, like jet turbine blades, take a quick trip through the grinding department when the No. 3B does the work.

This powerful grinder handles heavy production schedules accurately... holds size to very close tolerances. The bed of the Abrasive No. 3B Surface Grinder is a single casting, heavily ribbed and reinforced for strength and rigidity. All other details of construction combine to make this the outstanding grinder in its class for ruggedness, power, and convenience of operation.

Write for complete details on the Abrasive No. 3B... find out how it pays to "put it on the 3B". ABRASIVE MACHINE TOOL CO., 16 Dunellen Road, East Providence 14, R. I.



Spindle and Head Assembly

Spindle
Alloy steel, hardened, ground and lapped. 1¾" diameter, taper nose, carried in phosphor bronze box at front, adjustable for wear, and super-precision ball bearings at rear. Whole assembly mounted in removable cartridge type housing.
Normal speed, 2290 R.P.M.
Spindle driven by endless flat belt.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

SAY "GOODBYE"

TO BIG PROBLEMS WITH SMALL PARTS

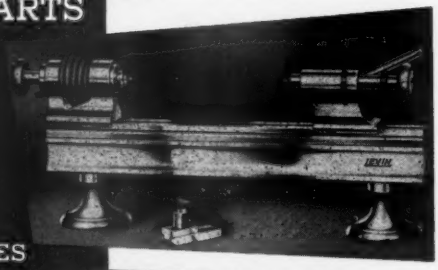
INVESTIGATE

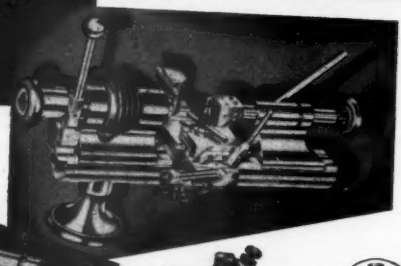
LEVIN

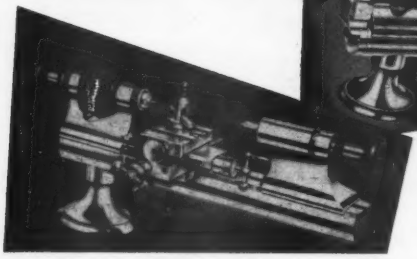
PRECISION JEWELER'S LATHES, ACCESSORIES AND MICRO-DRILL PRESSES

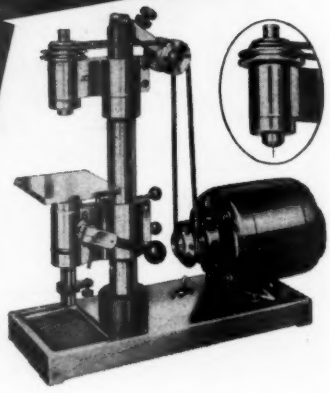
SEND FOR COMPLETE CATALOG

Ideal for second operations or experimental work on small instrument parts where sensitivity is required. Releases expensive, larger lathes for more suitable work. Full line of accessories available.









An extremely sensitive drill press for very small drills down to .002". Drills held in accurate collets to minimize deviation. Spindle run-out less than .0001". Finger tip control enables operator to feel progress of drill.

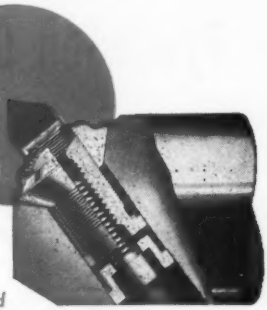
LOUIS LEVIN & SON, INC.
782 E. Pico Blvd., Los Angeles 21

MICROBORE
by DeVLIEG

FOR PRECISION WORK
EQUIPPED WITH STANDARD MICROBORE TOOLS

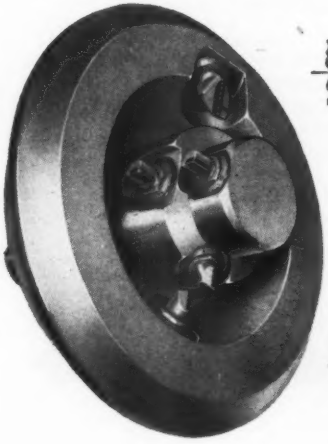
Special Boring Bars

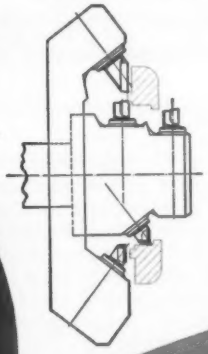
BORING ●
TURNING ●
FACING ■



Each tool independently adjusted by proven micrometer, vernier principle.

Illustration shows a special tool used in boring and turning a bearing housing for farm implements.





There is a Microbore representative in your area who will be pleased to call on you for further consultation.

ILLUSTRATED CATALOG MAILED ON REQUEST

DeVLIEG MICROBORE COMPANY
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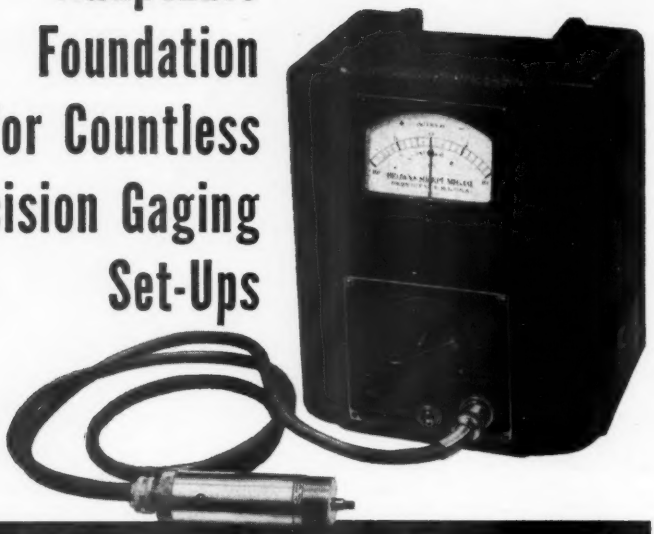
FERNDALE 20, MICHIGAN, U.S.A.

SEE ADVERTISERS INDEX, PAGE 155, FOR KEY NUMBERS

Adaptable Foundation for Countless Precision Gaging Set-Ups



Brown & Sharpe Gage Head Cartridge and Electronic Amplifier

Here's a really economical basis for versatile precision gaging equipment.

The Brown & Sharpe Gage Head Cartridge and Electronic Amplifier provide accurate gaging, with direct-reading indications, in units of .0001" to .00001". Simple jigs or fixtures to hold the cartridge often can be made in your own plant. By shifting the same cartridge among a number of fixtures, you can do precision gaging of practically any length, diameter, or other dimension. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

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Visit Booth No. 1435
A. S. T. E. Show, Chicago.

B·S
Brown & Sharpe

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a critical **ORDNANCE** job solved with . . .

die
BY MOORE SPECIAL TOOL CO.

die set
BY **PRODUCTO**

Millions of small ordnance fuse component springs stamped exactly right. Tolerance between punches and dies is maintained thru 18 stations at .0005" . . . only the top quality of Producto Die Sets makes such accuracy possible.

OPERATIONS: Piercing, forming, blanking.
SIZE OF PIECE: 1¼" long, ⅛" wide.
MATERIAL: .012 spring steel.
PIECES PER GRIND: 100,000.
PRODUCTION: 9,600 pieces per hour.

For definite dollar savings, maintained accuracy and highest production, specify "PRODUCTO" . . . approved by the country's leading manufacturers.

SEE OUR EXHIBIT at the TOOL ENGINEERS INDUSTRIAL EXPOSITION CHICAGO, BOOTH NO. 1104

the **PRODUCTO MACHINE COMPANY**
970 HOUSATONIC AVENUE • BRIDGEPORT 1, CONNECTICUT

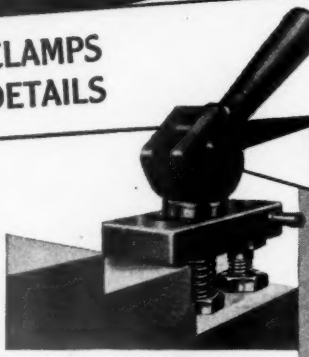
3P088

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

OVER FORTY YEARS OF FINE TOOLS

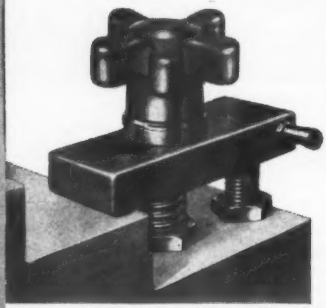
SIEWEK

FIXTURE CLAMPS
FIXTURE DETAILS



STANDARDIZE AND ECONOMIZE "SIEWEK" IS THE ORIGINATOR OF STANDARD CLAMPS AND DETAILS.

Drill Jigs .....161 Sizes
Fixture Clamps ... 73 Sizes
Fixture Details ...156 Sizes
Fixture Locks .... 12 Sizes



JACK LOCKS, FIXTURE LOCKS, CAMS, KNOBS, REST BUTTONS

Clamp assemblies and other parts necessary for the construction of special fixtures make up this standard Siewek line.

These Clamp assemblies themselves are made in 36 different types, most of them in three sizes. In other words, there is a type and size to meet the requirements of practically all shops.

Write for full size template sheets for Drill Jigs, Fixture Clamps and Fixture Details.

Also Manufacturers of Siewek Rapid Clamping Jigs & Fixture Details

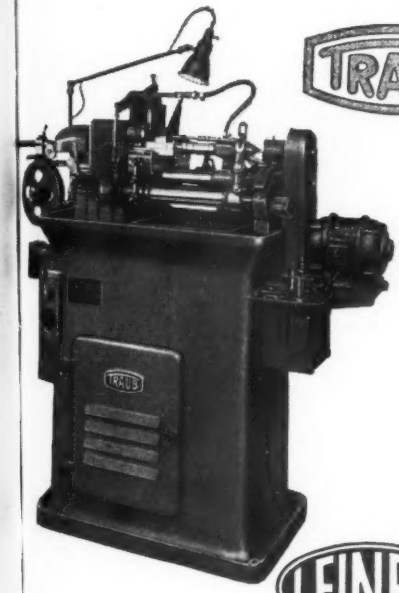
Siewek TOOL COMPANY

2862 East Grand Boulevard, Detroit, Michigan
BRANCH OFFICE: CHICAGO — Siewek Tool Co., 224 S. Michigan Ave. Wabash 5509, Chicago 4, Illinois

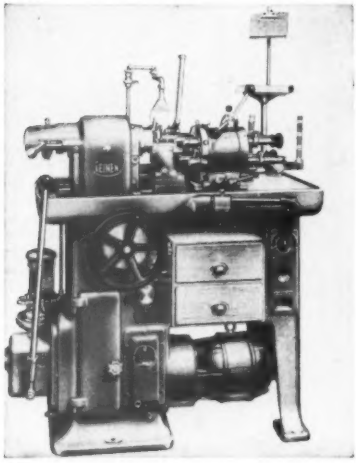
TURNING EQUIPMENT

By

Guthery

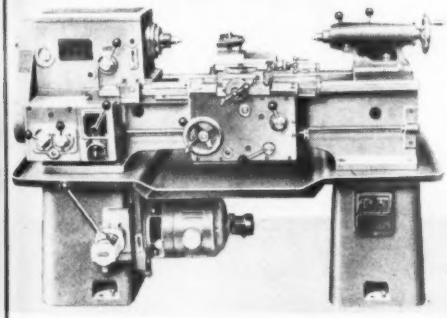


TRAUB AUTOMATICS 19/32", 13/16" 1", 1 13/32"
TRAUB THREADING MACHINES
TRAUB BAR POINTING MACHINES
TRAUB SLOTTING MACHINES
TRAUB PLASTICS & WOOD TURNING AUTOMATICS
TRAUB SERVICE BY TRAUB FACTORY TRAINED PERSONNEL
TRAUB PARTS FROM STOCK



LEINEN parts carried in stock

LEINEN PRECISION HANDSCREW MACHINES—TURRET LATHES
LEINEN PRECISION SCREW CUTTING LATHES
LEINEN PRECISION PLAIN LATHES
LEINEN PARTS FROM STOCK



WEISSER HEILBRONN

WEISSER parts carried in stock

WEISSER ENGINE LATHES
WEISSER HIGH-SPEED PRODUCTION LATHES
WEISSER "GOLIATH" TOOL ROOM LATHES
WEISSER PARTS FROM STOCK

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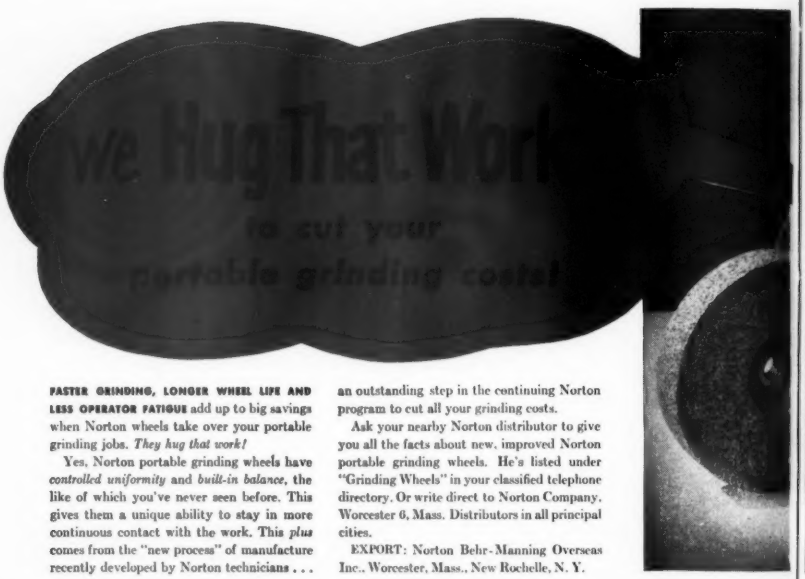
Exclusive U. S. Representatives

GUTHERY MACHINE TOOL CORPORATION

130 West 42nd St. New York 18, N. Y.



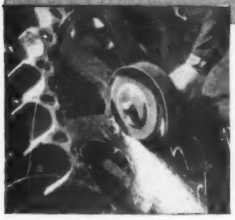
FASTER GRINDING, LONGER WHEEL LIFE AND LESS OPERATOR FATIGUE add up to big savings when Norton wheels take over your portable grinding jobs. *They hug that work!*

Yes, Norton portable grinding wheels have *controlled uniformity* and *built-in balance*, the like of which you've never seen before. This gives them a unique ability to stay in more continuous contact with the work. This *plus* comes from the "new process" of manufacture recently developed by Norton technicians . . . an outstanding step in the continuing Norton program to cut all your grinding costs.

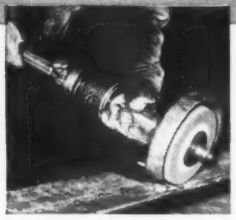
Ask your nearby Norton distributor to give you all the facts about new, improved Norton portable grinding wheels. He's listed under "Grinding Wheels" in your classified telephone directory. Or write direct to Norton Company, Worcester 6, Mass. Distributors in all principal cities.

EXPORT: Norton Behr-Manning Overseas Inc., Worcester, Mass., New Rochelle, N. Y.

NORTON PORTABLE GRINDING WHEELS HUG THAT



SNAGGING GIANT DRIVE WHEELS is just one of many jobs done by Norton straight wheels at lower labor and wheel costs. *They hug that work.* So, they don't waste time or wheels . . . nor tire the operator.

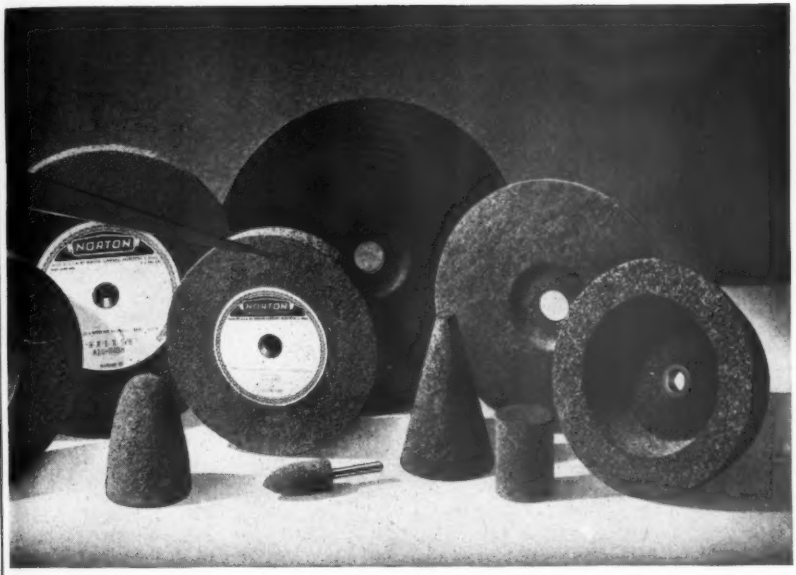


HEAVY DUTY WELD GRINDING is another job for which Norton straight wheels are the popular choice. Their controlled uniformity and built-in balance keep them cutting faster, easier and longer.

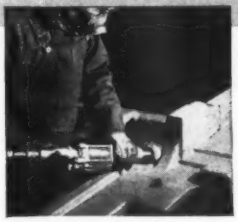
SURFACING A MACHINE TOOL BASE is easy work for a Norton cup wheel and its operator. The wheel's fast, smooth cutting action means low grinding cost and minimum operator fatigue.

Making better products to make

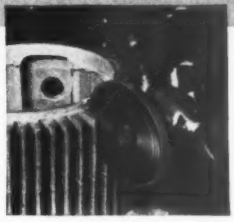
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION



WORK AND CUT YOUR COSTS ON JOBS LIKE THESE:



SMOOTHING UP THIS BED CASTING OF A PRINTING PRESS is a typical example of the cost-cutting performance of Norton cone wheels. They're built to take it . . . thanks to the special Norton resinoid bond.



CLEANING BETWEEN THE FINS OF THIS COMPRESSOR CASTING is an easy job with a Norton REINFORCED Hub Wheel of the rigid type — the BD. It's fast cutting, and its layers of fabric reinforcement assure maximum safety.

BLENDING IN A WELD can be done speedily with the new flexible Norton REINFORCED Hub Wheel. It's known as the Type BFR and is not only fast cutting but safe to use because of its fabric reinforcement.

other products better

NORTON ABRASIVES

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

HARIG GRIND ALL FIXTURE

PERFORATOR GRINDING ATTACHMENT

Permits grinding any of these irregular shapes concentric with shank within ±.0002

Write ... Illustra... Catal...

FASTER SET-UPS

GRINDS THESE CONTOURS witho... REMOVING FROM FIXTU...

HIGHER DEGREE OF ACCURACY

TIME SAVINGS UP TO 300%

Made by America's Foremost Manufacturer of Precision Dies

HARIG LAMINATION DIES

ALSO BLANKING DIES, DRAW DIES, PROGRESSIVE DIES, JIGS AND FIXTURES, MOLDING DIES, SPECIAL MACHINE WORK

THE ULTIMATE IN PRECISION WORKMANSHIP

HARIG MANUFACTURING CORPORATIO...

321 North Albany Avenue • Chicago 12, Illino...

2 Duplicators in 1

with TWIN SPINDLES ..a GORTON Tracer-Control Development

Now engineers can plan ahead for stepped-up production with the duplicator they specify today!

A Tip to Increase Defense Production

Two sets of multiple blades duplicated simultaneously from single master blade on Gorton 9-J.

You'll find Gorton Twin-Spindle Duplicators ideal for long production runs of profiling or die and mold cutting operations—both roughing and finishing, in two or three dimensions.

If your present production schedule doesn't warrant twin-spindle operations, install a conventional Gorton Duplicator now. Whenever you feel the need, you can easily change to the twin-spindle head and ram assembly—cost of conversion only 22% of complete single-spindle machine. This doubles the ability of your duplicator to turn out work.

Whether you need a conventional or twin-spindle duplicator, Gorton's general catalog contains important information for you. Write for it.

JOB FACTS

Gorton Super-Speed 9-J Duplicator with twin-spindle head assembly and rotary tables, equipped with two high-speed, 4-flute spiral cutters turning at 980 rpm for both roughing and finishing, profiled from the solid 20 impeller blades 9/16" high by 2" long. Cutting time: 4½ hours. BONUS: One *extra* identical work piece finished completely from one simple master of one blade.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1203.

Firm .....

Name .....

Title .....

Address .....

City, State .....

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

HARD
CHROME PLATED
PISTON
ROD
SOLID CAST
HEAVY CONNECTING
ROD
MACHINED from
SOLID BAR
STOCK

AIR CYLINDERS
Meet J.I.C. PNEUMATIC STANDARDS

(Write for FREE copy of these "Standards")

The four features illustrated above serve to show how Miller Air Cylinders *for years* have been meeting—*even exceeding*—the high quality set by the recently adopted J. I. C. Pneumatic Standards for Industrial Equipment. See for yourself! . . . write for our free bulletin A-105 and receive also your own *free* personal unabridged copy of these "Standards" with standard symbols, sample circuit, interesting point-by-point comparison—all neatly compiled into a handy booklet that fits your reference file and folds to fit your pocket.

VISIT OUR BOOTH NO. 1731 A.S.T.E. SHOW

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

MILLER MOTOR COMPANY

2046 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR VALVES

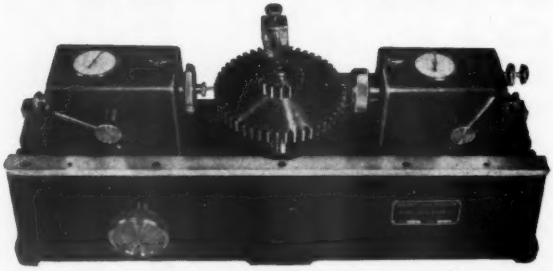
CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS
MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE
ST. LOUIS and OTHER AREAS.

Sales and Service from coast to coast

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

ORLANDI *Gear Checker*

Simple • Fast • Accurate



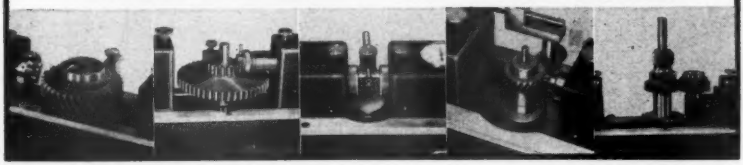
MAKES GEAR CHECKING SO FAST AND INEXPENSIVE YOU CAN USE IT AT EVERY PRODUCTION STAGE, BLANK TO FINAL, AND REDUCE THE COST OF SCRAP!

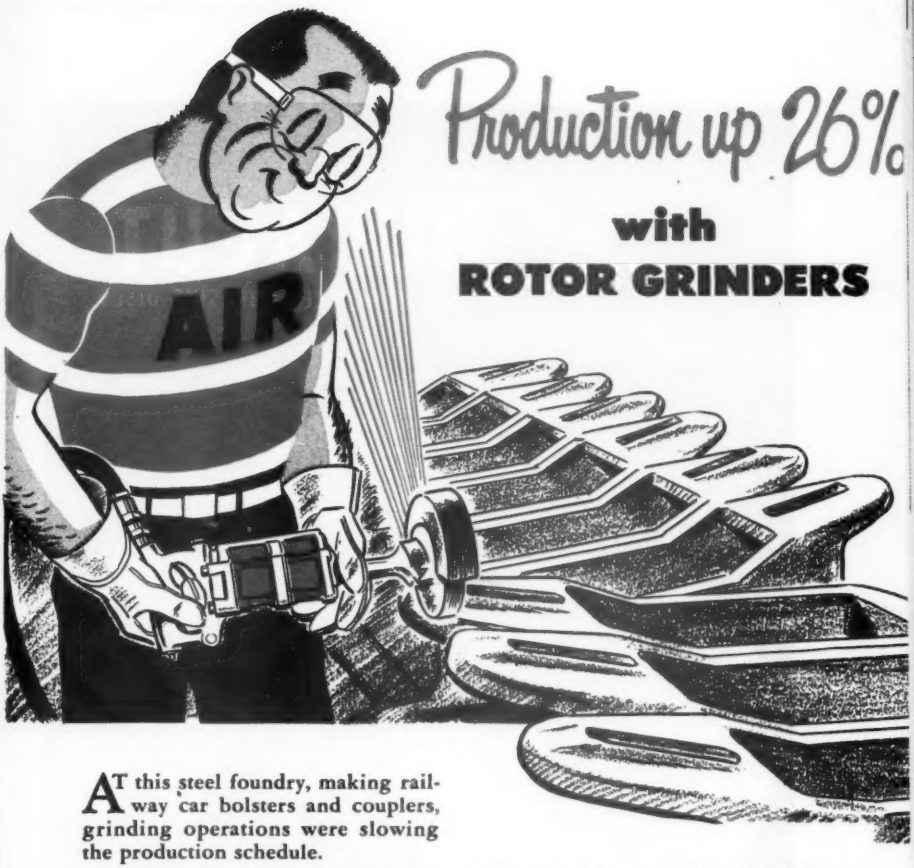
CHECKS P. D. (with pins or balls) of spur, helical and worm gears . . . **CHECKS** concentricity (no master req'd) of spur, helical (R. or L.) and worm gears . **CHECKS** parallelism of spur gears . . . **CHECKS** helix angles . . . **CHECKS** tooth spacing, tooth to tooth or 180° . . . **CHECKS** concentricity of gears also with masters as a rolling fixture . . . **CHECKS** backlash with mating gears with rolling fixture attachment or pins . . . **CHECKS** P. D. of any thread form with 3 wires.

Condensed list of users
Addressograph-Multigraph
Borg-Warner Corp.
Caterpillar Tractor
Chrysler Corporation
Ford Motor Co.
General Motors Corp.
International Harvester
Mass. Institute of Tech.
U. S. Slicing Machine Co.
U. S. Arsenals
Westinghouse Electric

ORLANDI GEAR & MACHINE CO.
Manufacturers of fine pitch precision gears
16195 Meyers Rd. • Detroit 35, Mich.

3 MODELS:
0"- 6" P.D. $1175
0"- 10" P.D. $1550
0"- 15" P.D. $1965
Attachments Extra
Larger models on special order.





Production up 26%

with ROTOR GRINDERS

AT this steel foundry, making railway car bolsters and couplers, grinding operations were slowing the production schedule.

PROBLEM: Need for more finished pieces per day. Reduction of high wheel cost. Reduction in "down time" of equipment for repairs. Formerly used 8", 13-pound grinders.

SOLUTION: Rotor Application Engineer recommended 6", 6,000-rpm Rotor Grinders. Weigh only 9¾ lbs.

RESULTS: Production stepped up 26%. Less operator fatigue. Wheels last longer. Finishes are better.

The Rotor Application Engineer can help *you* too. Call or write for Catalog #38.

AIR O'TOOL

AIR

THE ROTOR TOOL CO.

HIGH CYCLE

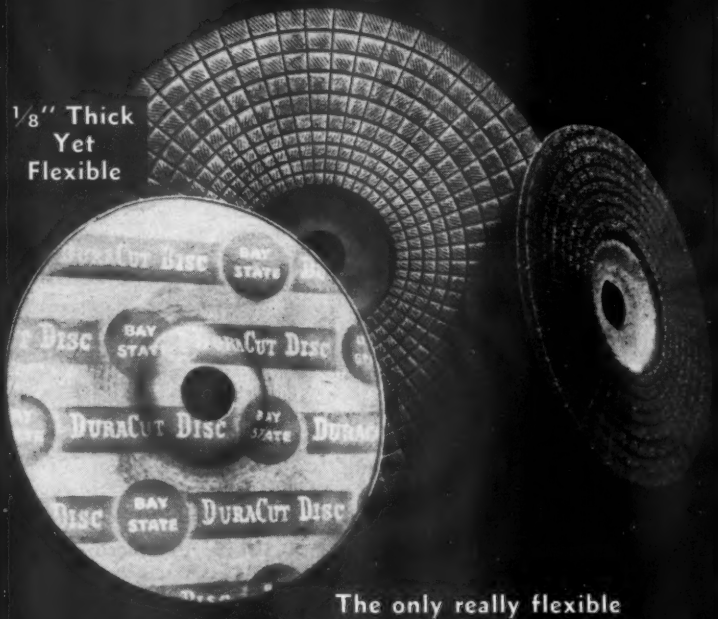
CLEVELAND OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

DURACUT

NYLON REINFORCED ABRASIVE DISCS

1/8" Thick
Yet
Flexible



The only really flexible
grinding wheel ever offered

for blending welds the *Better* way

better because - They are More Durable

DuraCut's life expectancy is 10 to 25 times that of ordinary coated abrasive discs, meaning less down-time for disc-changing — more productive time on-the-job.

better because - They are Faster Cutting

DuraCut's unique waffle pattern with multiple layers of abrasive grain allows sharp, instantaneous cutting throughout the life of the wheel. Whether it's light snagging, smoothing or blending, there's a wide range of specifications to assure obtaining a fast-cutting, long-lived wheel for your job.

better because - They are Built Stronger

Every component part, from bond to backing, is designed and treated so as to lend added strength and flexibility to the finished product.

TYPICAL APPLICATIONS:

Finishing light welds on sheet metal jobs. Automotive, truck, railroad car or locomotive and aircraft body work. Blending welds on sinks, refrigerators, stoves, metal cabinets. Rust and scale removal.

ask for a demonstration on your work

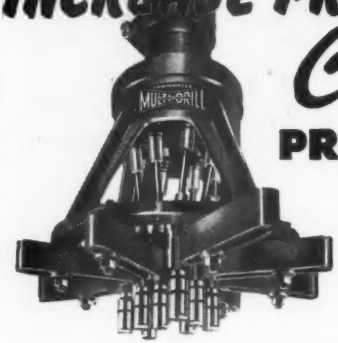
BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U.S.A.

Branch Offices and Warehouses —
Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE

SEE ADVERTISERS INDEX. PAGE 153. FOR KEY NUMBERS

INCREASE PRODUCTION with Commander PRODUCTION TOOLS

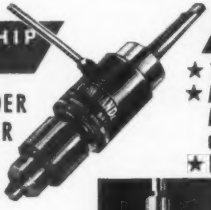


Adjustable MULTI-DRILL

★ DRILLS UP TO 8 HOLES AT 1 STROKE
★ ADJUSTABLE TO *ANY* HOLE PATTERN
★ FITS *ANY* DRILL PRESS

You can drill 2 to 8 holes at one stroke of a MULTI-DRILL equipped drill press. Instantly and easily adjusted to any hole pattern . . . compact in design and ruggedly built for years of service, thousands of MULTI-DRILLS are cutting costs and increasing output up to 800% wherever metal, wood or plastics are drilled.

New DRILL CHIP BREAKER



Get these COMMANDER DRILL CHIP BREAKER benefits now:

- Faster Drilling
- Deeper Holes
- Better Holes
- Longer Drill Life
- Safer, Cleaner Work
- REDUCED DRILLING COSTS

Write for illustrated Circulars on Commander Production Tools.

SEE US AT BOOTH No. 1238 ASTE SHOW, CHICAGO

ORDINARY CHIPS

CHIP BREAKER CHIPS

COMMANDER TAPPER

★ 1 Tapper Handles Taps #0 to ¾"
★ Automatically Sensitive... Any Operator Can Do Precision Tapping
★ Fits ANY Drill Press

Commander Tappers "think for the operator"—automatically stop when taps are dull, overloaded, or when they strike bottom in blind hole tapping —permit faster tapping, better work, even with inexperienced operators. Torque control provides positive tap protection from #0 to ¾"...spring clutch eliminates slippage, assures smooth, quiet, easy operation.

Commander MANUFACTURING CO.
4228 W. KINZIE ST. • CHICAGO 24, ILL.

New 2½ inch Hitch Feed takes industry by storm

Dickerman 2½ in. HITCH FEED

Designed for mounting directly on die set—though it may be attached to bolster. Has wider range, greater control. Handles stock up to .050" thickness. Handles intricate multi-station dies as well as everyday blanking and piercing dies.

No tools are required for adjustments. Carbide wearing and gripper plates assure years of service.

Introduced six months ago, the Dickerman 2½" Hitch Feed has already established itself as a top favorite. Repeat orders for this Feed are positive proof of the performance and service you can expect.

Write today for further details . . . see for yourself.

H. E. DICKERMAN MFG. CO.

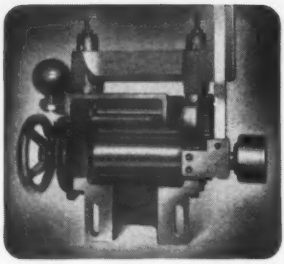
Dept. C, 323 ALBANY STREET SPRINGFIELD, MASS.

SEE US AT THE SHOW — BOOTH NO. 1108

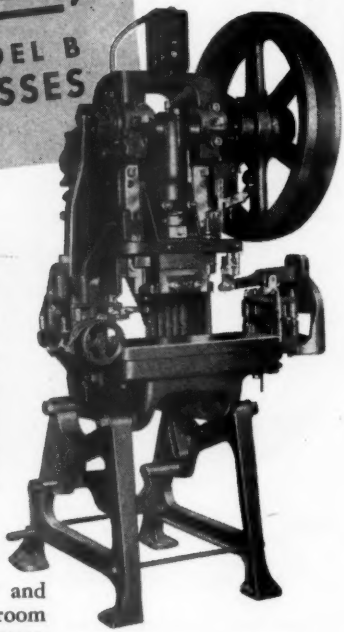
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

More Press Capacity

PERKINS MODEL B INCLINABLE PRESSES



Single Feed Roll



Round out your press capacity and boost the efficiency of your press room with these efficient, versatile presses. Protect your press operators and increase production with the use of Perkins Feed Rolls.

This No. 351 Model B Inclinable Press with 20 ton capacity, has single feed roll and adjustment for stock line, accurate overrunning clutch and top roll lift. Will feed stock 6″ wide to a length of 0″ to 8″. Write for bulletin.

PRESSES BUILT TO SPECIAL SPECIFICATIONS

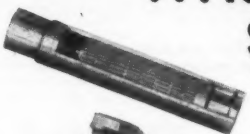
Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

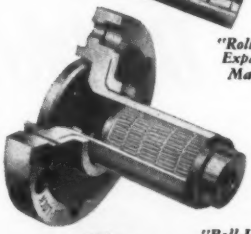
THE NEW

. . . for precision work

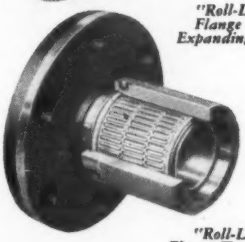


SCULLY-JONES

"ROLL-LOCK"* CHUCKING TOOLS



"Roll-Lock" Expanding Mandrel

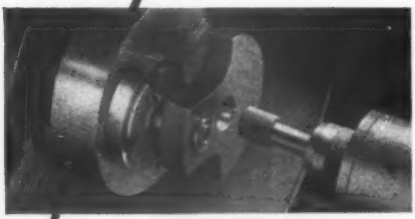


"Roll-Lock" Flange Type Expanding Arbor

"Roll-Lock" Flange Type Chuck

"Roll-Lock" Mandrels, Arbors and Chucks use a new chucking method for holding work or tools. This method takes advantage of the elastic properties of metal.

When a very little turning force is applied to actuating ring or cone, the powerful wedging action of rollers expands or compresses the chucking surface to a shrink fit. This permits maximum torque and thrust to be transmitted, assuring accuracy often less than .0001". "Roll-Lock" Chucking Tools are engaged or disengaged quickly and easily. Yet the shrink fit cannot be loosened by reversing the rotation of the tools or by shock and vibration.



Shown to the right are two of the many applications in turning, grinding or inspection operations. "Roll-Lock" Flange Type Expanding Arbor and Tool Chuck being used in a finish grinding machine for holding the work and grinding tool.

**"Roll-Lock" is a trade mark of Scully-Jones and Company.*

WRITE FOR BULLETIN No. 17-50
giving detailed description and technical data on these and other "Roll-Lock" Chucking Tools.

Scully-Jones AND COMPANY
1913 S. Rockwell St., Chicago 8, Ill.

B-5HEMT

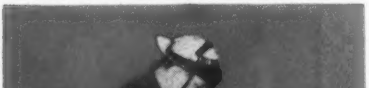
YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

DEBURRING and removing sharp edges on rough cast surfaces is short work when you use files and cutters of the right shape . . . driven at correct speeds . . . tools last longer, too.

FILING and finishing metal patterns with Haskins equipment gives you precision craftsmanship . . . quality production. Wide selection of files and cutters meets all job requirements.

GRINDING rough castings is another tough job made easy with Haskins dependable power. Because you handle only a light handpiece, not a heavy motor, work is faster, labor cost lower.

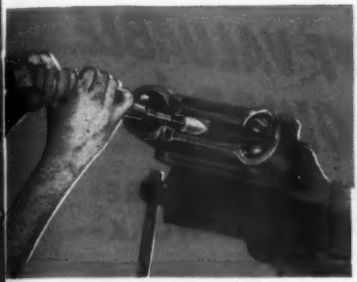


WELD BLENDING calls for Haskins power with drum and disc sanding attachments for smooth, flawless seams.

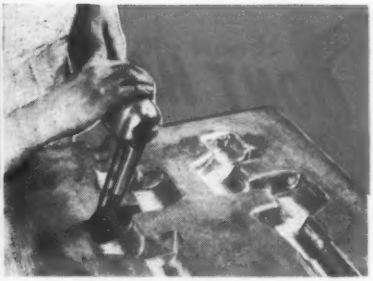
On Work

. . . WORK WITH

CHOICE OF MOUNTING— SUSPENDED, BENCH OR PEDESTAL



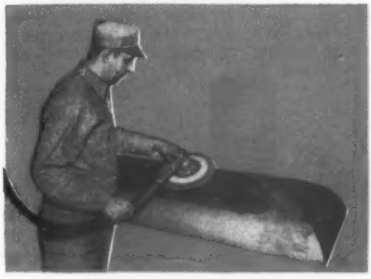
POLISHING precision molds to mirror-like finish assures constant, pit-free molding. Here an 1154 machine with special felt bob does the job better—with less operator fatigue.



HI-SPEED GRINDING for more accurate and finer finished die cavities. Special offset head is typical of Haskins special engineering of grinding and finishing attachments.

like this...

haskins
FLEXIBLE SHAFT EQUIPMENT



BUFFING a finish to high luster is another quality job done better by Haskins. Right angle head and right buff allow the operator better control for better work on lacquered metal or wood surfaces.

You can take the work out of jobs like these in your plant when you put Haskins flexible shaft equipment to work—stepping up production . . . quality . . . doing the job easier at lower cost. For Haskins brings you profit-making advantages like these: constant power for sustained operation, even on heaviest duty . . . handling only a light handpiece, not a heavy motor, operator fatigue is reduced, work standards are higher . . . higher speeds mean better work, faster, with longer tool life . . . multi-speed design gives you one machine capable of many jobs.

Write us today for recommendations on those tough jobs of yours. R. G. Haskins Co., 605 S. Washtenaw Ave., Chicago 12, Ill.

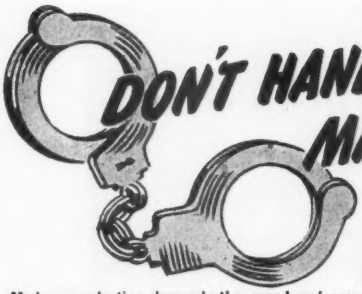
haskins
FLEXIBLE SHAFT EQUIPMENT

See Us at the Tool Show!

BOOTH 333

Let us show you how the right combination of Haskins power, speed, attachments and accessories can do your job faster, easier —at lower cost.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

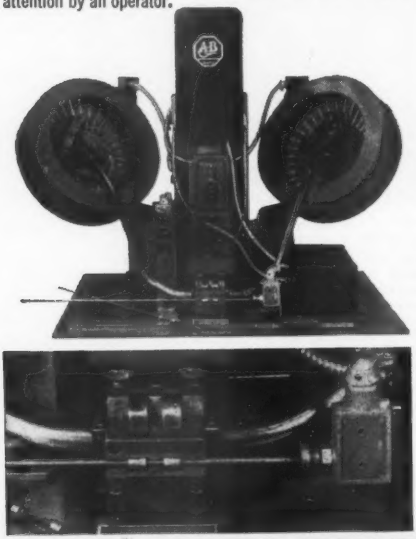


DON'T HANDCUFF VALUABLE MANPOWER!

FREE IT FOR MORE IMPORTANT WORK— BY USING

DPS *Motorized* **HOPPER UNITS**

Modern production demands the speed and accuracy of this great aid to SELECTIVE FEEDING. It makes slow, manual methods obsolete and releases "frozen" manpower for more productive work. D.P.S. Motorized Hopper Units select, orient and feed production parts of a wide variety to a given position for primary and secondary operations. They are readily adaptable to all types of standard production equipment and special machines that would otherwise require constant attention by an operator.



At left—Semi-automatic method of inserting flare nuts on tubing prior to the tube flaring operation. The tube nuts are pre-selected and fed in the motorized hopper units, delivering them in a uniform position; and a transfer mechanism is provided to align the nuts so that the operator simply inserts the tubing through the two nuts, and makes contact with a micro switch which ejects the assembly from the machine. This formerly was strictly a manual operation, the operator individually handling each one of the flare nuts and selecting it for placement on the tube.

SEE US AT THE A.S.T.E. SHOW MARCH, CHICAGO
BOOTH NO. 140

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICHIGAN

first & finest!

Jones & Lamson Radial Chaser Die Heads

GROUND with THREAD CHASERS

These Die Heads will do an outstanding job on large or small lots, in pitches ranging from extremely fine to coarse multiple Acme.

They are versatile tools with an over-all capacity of from No. 8 to $4\frac{1}{4}$".

They require no more than the proper chasers to cut either right- or left-hand threads. No extra equipment is needed.

They are easy to install and simple to handle. For almost half a century J&L Dies and Chasers have been the answer to a multitude of threading jobs throughout the world.

Look at these features that make J&L leaders in the field and give you better threads at lower cost:

STRENGTH

Every part is of solid steel, hardened and ground where necessary. There are no built-up sections. Dependability and ultimate capacity are assured.

FLOAT

All models are built with both concentric and longitudinal float.

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Heavy rough cuts, followed by light, accurate finishing cuts can be taken with the same set of chasers by merely moving the roughing attachment lever. This is often a chaser saver on heavy, coarse pitch jobs, especially where sharp chamfers are a requirement.

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The external micrometer adjusting screw provides simple and precise setting to exact pitch diameter. It is easy to set and maintains accuracy well within your thread tolerances.

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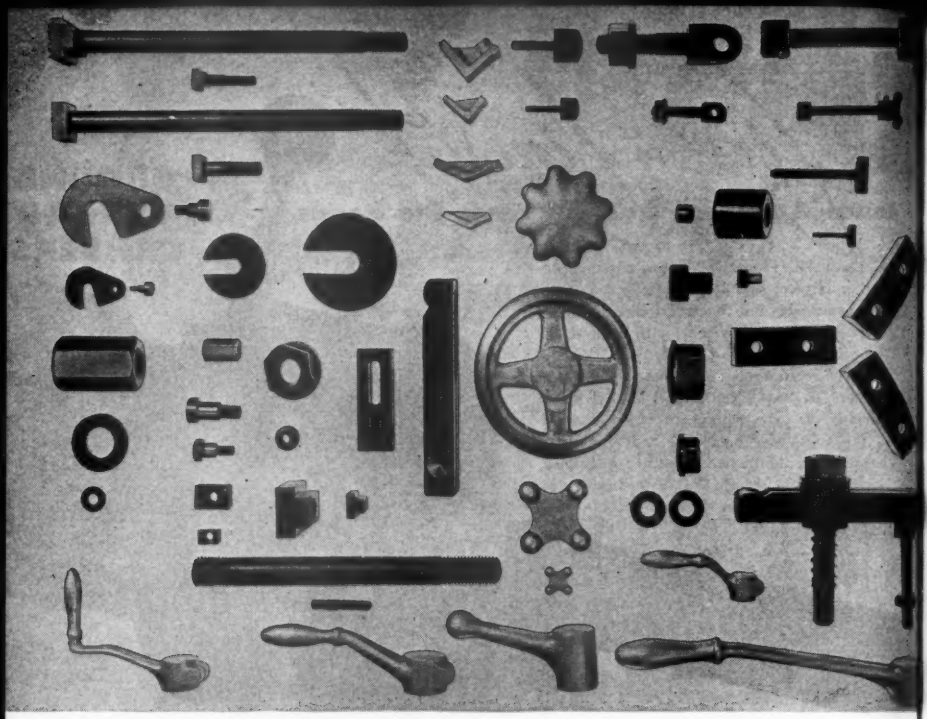
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835



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Jergens **TOOL SPECIALTY CO.**

712 E. 163rd ST. . . . CLEVELAND 10, OHIO

the security of craftsmanship

We insist upon taking the greatest pride in the fact that this country of ours is the world's leading exponent of free enterprise and rugged individualism.

It is alarming to see many youngsters looking with raised eyebrows, if not disdain, upon the ways and means by which we (and incidentally, they themselves) have come to enjoy man's highest standard of living.

Those ways and means include, primarily, the personal attributes of willingness and desire to be trained, to work, to welcome competition as a personal challenge, to take pride in accomplishment, to engage in creative endeavors, to expect reward not for serving time but for doing a good job, to build a stake, and, with the acquisition of skill and experience, the urge to undertake venturesome enterprise.

This may sound very trite, and may savor of the Horatio Alger pattern (and probably dates us beyond recall) but just what else, in the final analysis, has there been to account for our progress?

It is the builder who is the key to our success as a national enterprise; the man who builds something, and who does it with the urge to build better than his competitors.

So when we hear of young job seekers concerning themselves more with a prospective employer's pension plan than with the opportunity to learn and to acquire skills that can never be taken away, we wonder where we will get our future builders; or who will build for them.

Are these youngsters really content to think of simply serving time in order to attain a relative pittance on which to subsist after age 60 or 65? We are more inclined to believe that in many cases it is due to the lack of being shown where opportunities exist.

Of all builders, the builders of tools are the prime movers on which our economy is based. Builders of tools are craftsmen in the truest sense of the word; they always have been and they always will be.

The tool builder creates the means whereby materials become products. Tool building skills are in short supply and the hope for relief is dim. The training of a skilled tool maker or master machinist is not accomplished in short order or by government edict. But the full and final attainment of those skills constitutes a sense and actuality of security that is a foundation on which to build; the security of craftsmanship. On this craftsmanship can be built a tool making or machining enterprise that can multiply the skills and earnings of the individual many times.

The organizations which are most representative of the need for these skills are the National Tool and Die Manufacturers' Association and the National Machine Tool Builders' Association. Without the skills and products of their members, our economy would come to a standstill overnight.

Between them they have the background of tradition, the inspirational and material resources, the record of accomplishment, the personal leadership, and the facilities for dramatic show-how, to enable them to "package" an appeal to youth that would generate mutually beneficial dividends.

Insurance companies, chemical manufacturers and financial organizations get out and beat the bushes for worthy trainees; why shouldn't the NMTBA and the NTDMA do likewise?

They have a tremendous story to tell; the Americana of metal working. Their joint effort would be welcomed and assimilated by parents, educators, guidance counselors and, most important, by the youngsters themselves. It would pay off.

E. Willard Pennington

editor

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TOOLS

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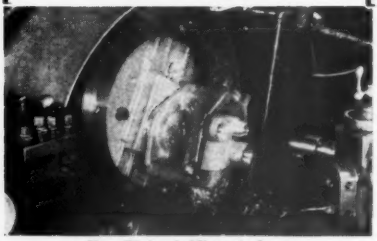
A.S.T.E. Show March 17-21

enables you to do 101 jobs on your machines at tremendous savings in time and tool cost!



Vee Plate holding tool on Micro Adjustable Face Plate.

Ell Plate holding tool on Micro Adjustable Face Plate.

Here's the tool that is the sensation of the tool industry today. It enables you to do complicated, offset, or regular precision machining at unbelievable savings in time and tool costs. With it you can do jobs you might otherwise never attempt, easily, quickly and at long profit. See it at the A.S.T.E. show in Chicago, or if you are not attending, write direct today for further information.

MICRO LATHE PLATE INC.

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Dept. T. CLEVELAND 13, OHIO

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"Reo Applies Automotive Tooling Know-How to Mower Production," by Granville R. Conrad and Donald G. Bay, Reo Motors, Inc. 62

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pany in the development of titanium. Commercial production has been stepped up from 100 pounds a day in 1948 to 1½ tons a day at this time.

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A resume of the safety measures which have been put into effect at the Indiana Forge and Machine Co.

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This relates how a machining job was reduced from 4½ hours to 30 minutes per piece.

"VPI Chemical Eliminates Rusting of Steel Micro Specimens," (Jones & Lamson Machine Co. **186**
Corrosion of micro specimens has proved to be a problem entailing considerable time and cost in repolishing and re-etching. Jones & Lamson has found the solution to this problem.

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"PUBLICATION PREVIEWS" **144**
Here's a wealth of information, but too much to carry in your head. Study it over and file it; then you'll have it when you need it.

"SHOP AIDS" **166**
We've briefed the content of these catalogs to save you time in getting information on your requirements.

"QUICK-PIC CATALOGS" **180**
Here we've practically put some of today's newest literature up on a rack ready for you to take your pick.

"PROGRESS ON PARADE" **204**
Each and every one of these new machines, tools and accessories is capable of saving money or increasing productivity on a job that may be baffling you; or of performing a new job that has come up.

It will be to your advantage to be familiar with the improved

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INSPECTION *Marking* SYSTEM for applying process and final inspection symbols to metal tools, parts and gages.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CEMENTED CARBIDE TOOLS

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Do MORE
METAL WORKING
in Less Time

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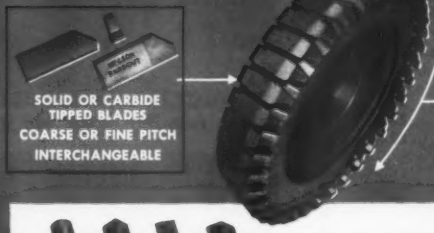

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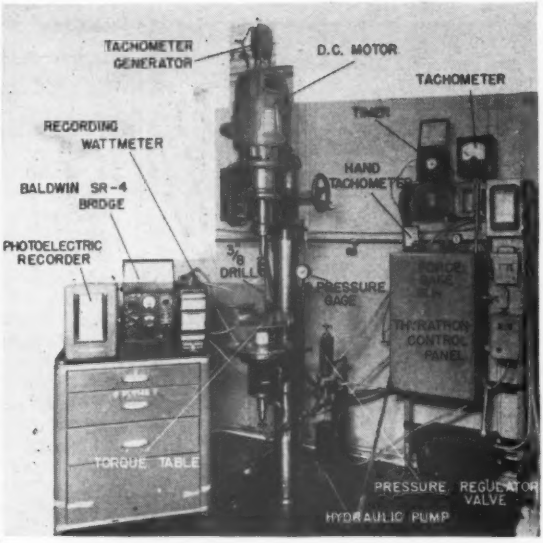
Editor's note: Under the heading of "machinability," Mr. Weller groups those characteristics which govern the rate at which a material may be machined. At the same time, "machinability" is a variable made so by such other variables as: design requirements of the part, the machining process and cutting tool employed, number of parts required, hardness level of the metal, etc. One of the great values to be derived from a familiarity with the machinability of a given metal arises when the machining must be performed under optimum conditions of metal removal. Then, by working backward it may be found that more horsepower is called for than is available at the spindle. Thus it may be disclosed that a given production program calls for new and larger machines. At the right is shown the equipment involved in conducting the drill penetration test.



Evaluation of Machinability

The characteristics which govern the rate at which a material may be machined generally are termed "machinability."

Machinability is variable: it is affected by the design requirements of the part, the machining process and cutting tool employed, the number of parts required, the hardness level of the metal, etc. Therefore, machinability is not an independent property to which a definite value may be assigned; it is instead, a combination of variables which are so interdependent that they have been grouped together in a single term.

Normally, machinability is limited by one or more factors. One of these is the finish required on the part; another is the combination of forces acting between the work piece, the cutting tool, and the machine tool; a third factor is the life desired of the cutting tools used. Various combinations of hardness, microstructure, composition, and processing of the material to be machined may cause variations in the machinability values assigned to each of the foregoing factors. Thus, laboratory values determined for the machinability factors, plus experience gained from specific production operations with particular materials and machines, offer a means for the practical solution of machining problems.

by **E. J. Weller**
Works Laboratory
GENERAL ELECTRIC COMPANY
Schenectady, N. Y.

Machinability Determinations

In machinability investigations, the greatest emphasis has been placed on the measurement of cutting forces, determination of tool life, and the assignment of relative machinability ratings to different materials. Therefore, these are the factors which will be discussed here at greatest length. However, this discussion must be somewhat limited, for even a study of only these factors may be expanded to such an extent that it is doubtful that any

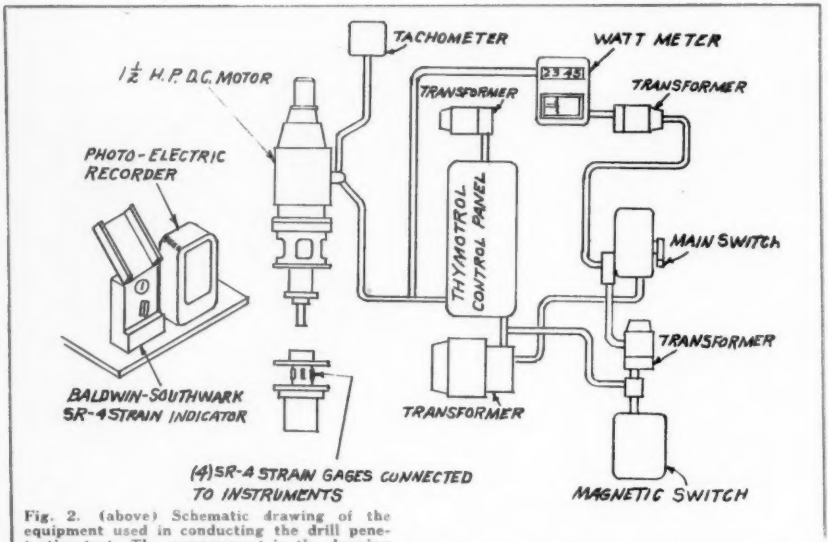


Fig. 2. (above) Schematic drawing of the equipment used in conducting the drill penetration test. The arrangement in the drawing conforms to the positioning shown in the photo on page 59.

Fig. 3. (below) Fine adjustments and periodic measurements are made with a hand-type tachometer.

individual or group could discover all of the variables involved, determine the effect of each of them on the others, and on the over-all result, and ultimately assign a quantitative value to machinability. (Mr. J. F. Allen of the Warner and Swasey Company has compiled a list of variables affecting machinability. The resulting possible combinations number approximately 1,650,000! See his paper, "Exploring Carbide Possibilities in Single-point Turning." published in "The Tool Engineer" for September, 1946.)

In these investigations, fixed conditions are used to establish basic data. It then is possible to determine, with reasonable accuracy, the conditions which should be set up on production tools and machines to obtain from them maximum productivity. It also is possible to determine which of the materials having the required physical properties has the best machinability for a particular operation or part.

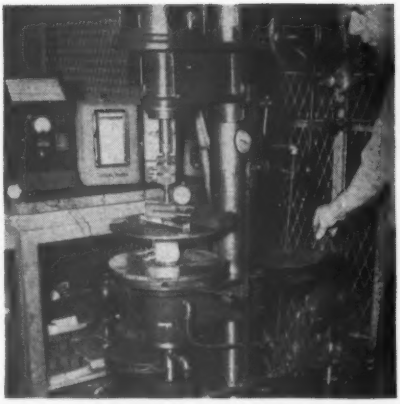
In order that it may be known how efficiently an operation is being performed, it is necessary to have a basis on which to work. The criterion of efficiency in machining may be considered to be a "balanced operation." Such operation exists when the following conditions are met concurrently:

1. The cutting tool is loaded to its design limit.
2. The cutting tool is operating at speed and feed conditions which will yield the desired tool life.
3. The machine tool is loaded to the limit of its rated output.
4. Parts are produced to the dimensions and finish specified.
5. Parts are produced in the quantities required, in the desired lengths of time.

To obtain balanced operation, the factory must select and properly apply the correct cutting tools and machine tools for the work to be done, and the parts must be designed with adequate consideration of the machining process to be used.

Thus, balanced operation demands that the factory have available information on the speeds and feeds of their equipment, the attachments which may be placed on the machines, and the horsepower and accuracy characteristics of the machine tools. Some of this information has been collected by the manufacturing divisions through their machine tool surveys, and from the data furnished by the machine tool manufacturers. Through the data recorded on planning cards, test results, the results of previous operations etc., it is possible to determine efficient operating conditions to be used with representative materials and cutting tools on the machines which are available. Designers and engineers must familiarize themselves with the manufacturing processes and equipment available and with the design requirements of the parts to be processed.

In the evaluation of such data, problems arise due to the difficulty of determining whether the tools and machines are producing at the limits for which they were designed. Similar problems arise in the selection of machining conditions for new materials received for processing, and in setting-up for use of new cutting-tool materials as they appear. To permit these problems to be solved in a reasonable length of time, it first is necessary to establish standard test methods. Some test methods which are expected to yield usuable basic data have been selected for trial. These will be described herein.



Tests for Rating Relative Machinability

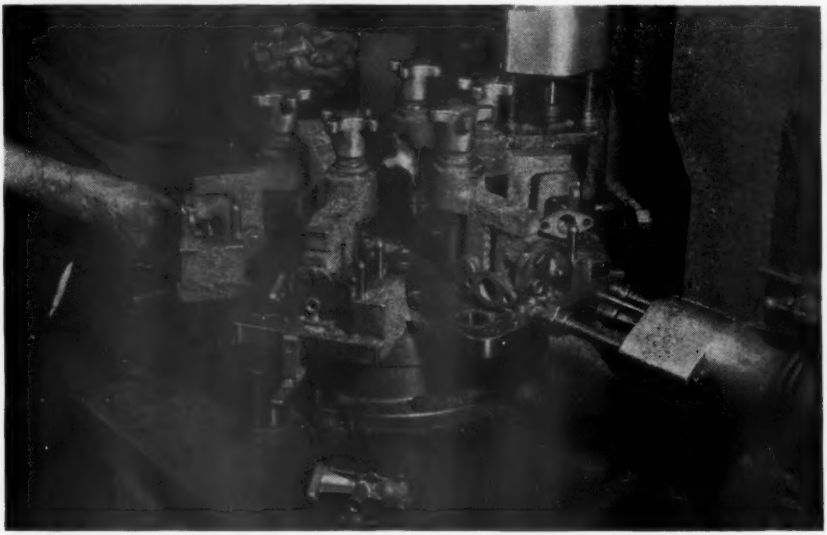
From the results of investigations of several different types of tests, it was decided that the drill-press would be used as the basis for rating machinability of a material. No measure of tool failure is made; in fact, caution is exercised to avoid tool failure. It is realized that any

(Continued on page 164)

Fig. 4. (above) For the test the spindle-head remains fixed, the table and workpiece being fed up to the drill by means of hydraulic pressure controlled by a balanced-piston hydraulic control valve. Normal test pressure is 240 pounds thrust.

Fig. 5. (right) This shows the auxiliary table, equipped with strain gages, which is used to measure torque.

Fig. 1. Special machine employed by Reo Motors, Inc., to drill, ream and tap holes in a die cast carburetor body on a fast automatic basis. Only loading and unloading are done by hand.



Reo Applies Automotive Tooling Know-How to Mower Production

Thanks in part to good tooling, Reo Motors, Inc., not only broke into the power lawn mower business successfully but has become one of the largest producers of this type of product. With the objective of producing rapidly and at low cost, the company has drawn heavily on its long automotive experience. The tools as designed lend themselves to large volume and highly economical production with emphasis on holding to high quality standards.

CARBURETOR BODIES

Indexing fixture expedites machining on carburetor bodies. The five sets of operations include the drilling, reaming and tapping of many holes in a die casting. A bearing hole on another piece is held within .0005 in. of a specified diameter by special reamer with carbide tips.

Among the critical components on power lawn mowers driven by small gasoline engines is the carburetor body, often called a mixing valve. Although this is an aluminum alloy die casting in which many holes are cored to, or close to, finished size, several additional holes have to be drilled. One hole is tapped and others are reamed. Although each operation is a single one, each must be done rapidly

by **Granville R. Conrad**
Senior Project Engineer,
Lawn Mower Engineering
and
Donald G. Bay
Development Engineer, Lawn Mower Division
REO MOTORS, INC.
Lansing, Michigan

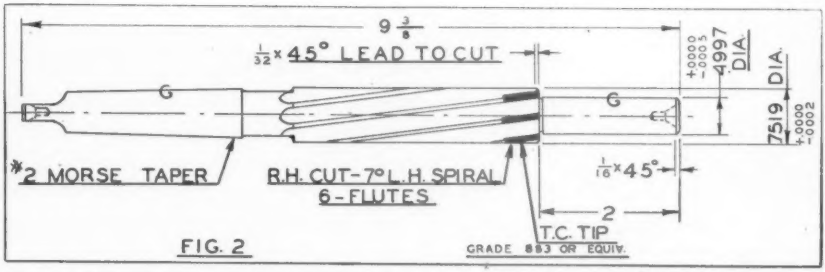


Fig 2. Special piloted reamer employed by Reo to make the finishing cut in lead babbitt bearings. The tool turns right hand but has left hand flutes. Carbide tips do the cutting.

and some dimensions must be held to quite close limits. The job requires that these operations be performed rapidly and at a minimum of cost.

In planning this machining of the die casting here considered, it was decided to build a special machine using standard power components to operate the tools, in conjunction with a six station fixture. The operation is automatic except for the work done by a single operator in loading and unloading the workpieces.

Much of the machine is shown in Figure 1. Loading and unloading are done at station 1 after which the part is indexed successively through five stations at which each tool advances, makes its cut and retracts automatically. Stations 2 and 3 (left in Figure 1) are served by a single six-spindle Ex-Cell-O style 20, hydraulic power unit that is mounted with the spindles in a vertical position below the table.

At station 2, one 0.1250 in. and two 0.1562 in. drills feed up to drill holes in the casting. These holes are then reamed to 0.1290 in. and 0.1640 in. diameters, respectively, at station 3. Next, at station 4, (right in Figure 1) a Locke automatic head mounted radially and horizontally feeds in to drill a hole of 0.0430 in. diameter. Then, at station 5, a similar head placed vertically as well as another that is horizontal move in to produce 0.0292 in. and 0.0650 in. diameter holes, respectively.

Finally, at station 6, another head equipped with an Ettco-Emrick 2B tapping attachment equipped with a ⅜-24 tap threads a single hole. Total production on this machine is 121 pieces an hour.

Special Piloted Reamer

Finishing of certain bearing holes in lead-base babbitt is done in this plant with reamers like that shown in Figure 2, having a pilot extension below the cutting end where Grade 883 or equivalent tungsten carbide tips are inserted. These tools are used in drill presses with hand feed but with a pilot hole below the workpiece. The reamers have six flutes and turn right hand but have 7 deg. left hand spirals. Grinding provides a 3 deg. negative rake. Such tools produce holes within 0.0005 in. of nominal size and provide excellent finish.

REEL BLADE TOOLING

Reel blades are formed to helical shape by a combination of die work and rolling. Special machine produces circumferential groove in drawn wheel. Projection weld fixtures have novel design features.

A major subassembly of every mower is the reel that carries the cutting blades, and these blades are important components of this unit. They are made from 1 x ¼ in. high carbon (0.90 C) steel strip drawn with a hollow bevel near one edge. After cutting to length and having rivet holes pierced, the stock is sand blasted and is delivered to the press setup, Figure 3, where it is set on edge in the slot of the die, and is bowed to 18.136 in. radius by the punch.

It is then necessary to form the stock in such a way that the cutting edge of

(Continued on page 94)

TECHNICAL PROGRAM

ASTE 20th ANNUAL MEETING

Chicago, Illinois. March 17-21, 1952.

Monday, March 17th PRECISION CONTROL DAY

MORNING (Stockyards Inn)

9:00 A.M. Chairman: **Prof. O. W. Boston,** Chairman of Production Engineering Department, University of Michigan.
"COOPERATION BETWEEN RESEARCH CENTERS AND ENGINEERING SOCIETIES," by **Dr. W. E. Mahin,** Director of Research, Armour Research Foundation.

9:00 A.M. Chairman: **R. C. Peterson,** Manager, Peterson Engineering Company.
"THE PART OF STANDARDS IN BETTER CONSUMER RELATIONS," by **R. E. Gay,** President, Bristol Brass Company.
"RELATION OF THE TOOL ENGINEER TO COMPANY STANDARDS," by **Dr. John Gaillard,** American Standards Association.

9:00 A.M. Chairman: **R. A. Osborne, District** Manager, Peninsular Steel Company.
"STRENGTH OF BOLTED ASSEMBLIES," by **John S. Davey,** Assistant General Manager of Sales, Russell, Birdsall & Ward Bolt & Nut Company.

AFTERNOON (Stockyards Inn)

1:30 P.M. Chairman: **D. E. Hawkinson, Sales Engineer,** Greenlee Brothers & Company.
"CRITERIA FOR SELECTING SAMPLING METHODS," by **Dr. J. V. Strela,** Staff Statistician, Thompson Products, Inc.

2:05 P.M. Chairman: **F. J. Kampmeier,** Vice President, Ingersoll Milling Machine Company.
"FIXED-GAGE STANDARDS AND PRACTICE," by **W. H. Gourlie,** Standards Engineer, The Sheffield Corporation.

2:50 P.M. Chairman: **H. F. Ruehl,** Fairbanks, Morse & Company.
"PRODUCTION-LINE HARDNESS TESTING," by **V. E. Lysaght,** Sales Manager, Wilson Mechanical Instrument Division.

3:30 P.M. **PANEL DISCUSSION: "TURNING AND FORMING TOLERANCES"**
Moderator: **R. B. Knoth,** Assistant Superintendent of Manufacturing, Western Electric Company, Inc.
Robert Eckholm, Chief Inspector, Illinois Tool Works; **E. L. Fay,** Quality Control Manager, Deere & Company; **J. T. Leyden,** Service Engineer, Crucible Steel Co. of America; **N. G. Meagley,** Manager, Statistical Quality Control, Willys-Overland Motors, Inc.; **G. R. Morin,** Chief Sales Engineer, Jones & Lamson Machine Company; **D. J. Williams,** President, Connecticut Tool & Engineering Company.

EVENING

8:00 P.M. **North Ballroom, Conrad Hilton Hotel**
Chairman: **E. Y. Seborg,** Barnes Drill Company.
"CONTOUR MILLING OF SHEET STOCK," by **Jesse Daugherty,** Consultant, Giddings & Lewis Machine Tool Company.

8:00 P.M. Red Lacquer Room, Palmer House
Chairman: **G. H. Rigeman,** George D. Roper Corporation.
"CONTROL OF QUALITY ON MASS PRODUCED ENGINEERING PARTS," by **John** Laxham, Managing Director, Sigma Instrument Company, Ltd.

8:00 P.M. **Normandie Lounge, Conrad Hilton Hotel**
Chairman: **G. C. Johnson,** W. F. and John Barnes Company.
"IMPROVED MEASUREMENT AS A WAY TOWARD SAFER TOLERANCES," by **Jacques de Sangy,** Sales Director, Societe Genevoise d'Instruments de Physique.

Tuesday, March 18th METAL CUTTING DAY

MORNING (Stockyards Inn)

9:00 A.M. Chairman: **Vitas Thomas,** President, Tomco Products Company.
"COMPLETE DEEP HOLE PRODUCTION FROM TREPANNING TO FINAL FINISH," by **J. S. Ladendorf,** Deputy Director, Wohlfahrt Engineering and Manufacturing Co.

9:00 A.M. Chairman: **F. T. Wruk,** Executive Vice President, Peerless Machine Company.
"BROACHING OF INTERNAL GEARS," by **J. A. Psenka,** Engineer, National Broach and Machine Company.

9:00 A.M. Chairman: **W. N. Reinhardt,** Assistant Supt., Racine Tool & Machine Company.
"ELECTROMECHANICAL MACHINING OF HARD MATERIALS." by **M. F. Judkins,** Chief Engineer, Carbide Div., Firth Sterling Steel & Carbide Corporation.

A program of 50 technical papers and five 7-member discussion panels is a little too much for planning and laying out on the backs of old envelopes! So, Frank Wilson, Technical Director of the ASTE, set up this visual production control board for systematizing the handling, coordination and follow-up procedures necessary to insure a finished product which will pass inspection. Here he is with his secretary rescheduling one of those last minute "engineering changes"!

AFTERNOON (Stockyards Inn)

1:30 P.M. Chairman: **W. C. Davidson,** Tool Engineer, Modine Manufacturing Company.
"SPEED AND FEED SELECTION FOR EFFICIENT DRILLING," by **C. J. Oxford,** Chief Engineer, National Twist Drill & Tool Company.

2:05 P.M. Chairman: **G. S. Strambeck,** Education Coordinator, Racine Vocational School.
"PRECISION HOLE LOCATING METHODS," by **F. C. Victory,** Chief Engineer, Moore Special Tool Company, Inc.

2:50 P.M. Chairman: **G. F. Tigges,** Tool Engineer, Modine Manufacturing Company.
"DRILL JIG DESIGN FOR SECONDARY OPERATIONS," by **J. I. Karash,** Process Engineer, Reliance Electric & Engineering Company.

3:30 P.M. **PANEL DISCUSSION: "DRILLING"**
Moderator: **C. C. Waldo,** Asst. Master Mechanic, Electromotive Div., G. M. C.
M. S. Aljanich, Supt. of Tool Cribs, Caterpillar Tractor Company; **E. A. Brezina,** Chg. of Production Design & Application, The Cleveland Twist Drill Company; **J. Y. Riedel,** Tool Steel Engineer, Bethlehem Steel Company; **R. A. Schafer,** Ch. Development Engineer, National Automatic Tool Company; **B. D. Smith,** General Supvr., Mechanical Engrg. Research, International Harvester Company; **E. Von Hambach,** Research & Development Engineer, The Carpenter Steel Company.

EVENING

8:00 P.M. **Normandie Lounge, Conrad Hilton Hotel**
Chairman: **O. H. Arndt,** Tractor Engineering Department, Massey-Harris Company.
"RECENT ADVANCES IN METAL CUTTING SCIENCE AND PRACTICE," by **Hans Ernst,** Research Director, and **Dr. M. E. Merchant,** Senior Research Physicist, Cincinnati Milling Machine Company.

8:00 P.M. **North Ballroom, Conrad Hilton Hotel**
Chairman: **R. T. Jones,** Assistant Chief Tool Engineer, Walker Manufacturing Co.
"NEW DEVELOPMENTS IN CEMENTED CARBIDES," by **J. S. Gillespie,** Mgr. of Product Sls. and **I. L. Wallace,** Mgr. of Engrg., Carboloy Dept. of General Electric Co.

8:00 P.M. **Red Lacquer Room, Palmer House**
Chairman: **G. W. Christiansen,** Asst. Sales Mgr., Racine Tool and Machine Co.
"DYNATOMICS—A NEW CONCEPT IN METAL REMOVAL," by Kenneth R. Blake, Consulting Physicist and Vice President, Metalloid Corporation.

Wednesday, March 19th MATERIALS FORMING DAY

MORNING (Stockyards Inn)

9:00 A.M. Chairman: **H. M. Chambers,** Tool Engineer, International Vermiculite Company.
"TOOL ENGINEERS AND ELECTROFORMING," by **Dr. C. L. Faust,** Head, Electromechanical Engineering Division, Battelle Memorial Institute.

9:00 A.M. Chairman: **R. W. Wallace,** Technical Superintendent, Sangamo Electric Company.
"MULTIPLE SCREW MACHINE TOOLING AND METHODS," by **C. R. Morgan,** Consulting Engineer, Cone Automatic Machine Company, Inc.

9:00 A.M. Chairman: Prof. **J. N. Edmondson,** Production Division, Industrial Engineering, Ohio State University.
"APTITUDE TESTS AID PRODUCTION PERSONNEL," by Dr. J. E. King, Director, Industrial Psychology, Inc.

(Continued on page 90)

Carbide Tooling Improves Product Components

The present-day car owner has come to expect that those extras for which he pays good money should always operate and be trouble free. This is especially true of his car radio. However, the care and precision which enter into the manufacture of these radio components are not perceptible to users because they usually are installed in places difficult to reach.

by **Carl F. Benner**
Assistant Editor

The Radiart Corporation, of Cleveland, manufactures some of the equipment that goes into radio systems, particularly vibrators and antennae.

In addition to the routine of daily production of these parts at Radiart, the engineering department of this company is constantly working toward improved methods which will produce a better end product at a lower cost. Specially designed machines, dies and tools are found in all departments of the plant.

The use of carbides has been the solution to a number of difficult production problems and carbides, therefore, have been built into dies, cutters, tools and boring blades.

Carbide Swaging Die

The antennae built by Radiart are made up of three or four sections of telescoping tubing measuring from 2 to 2½ feet in length for most applications. To provide a stop for limiting the length and accuracy of telescoping, one end of each section is swaged to a reduced diameter as indicated in Figure 1-A.

The operation is performed on a specially designed swaging machine shown schematically in Figure 1-B. The swaging die, C, is made up of a steel die block into which a carbide insert, D, is set. The inside dimensions of the insert are those to which the tube is to be reduced, thus giving the tube end the required shape. To prevent the tube end from collapsing during the swaging operation and to hold the ID of the tube end to the specified dimensions, an ID sizing pin is incorporated in the die as shown at E.

The swaging is an axial operation and is performed by forcing the die onto the tube end. It is, therefore, necessary to hold the tube securely and also to provide a means to prevent it from being distorted and bent by the end thrust exerted as the die is forced onto the tube end. This is accomplished by a clamping arrangement which envelops 90% of the length of the tube as indicated by the cross-section block shown at F.

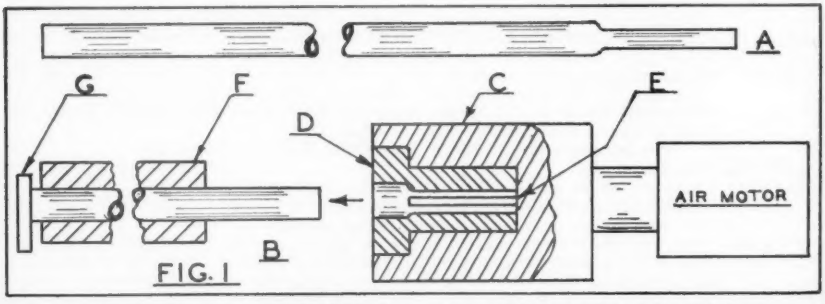


Fig. 1. Schematic view of a specially designed swaging machine for reducing the end diameters of telescoping antenna tubes. The carbide insert set in the swaging die has an approximate life of one million swaging operations. The tube diameter reduction is indicated at "A".

The die block is attached to the ram of an air motor and as the air motor is operated, its ram moves back and forth horizontally within set limits.

In the operation of the swaging machine, the operator places a tube in the holding fixture and clamps it securely against the gaging stop, G. As he steps on the actuating pedal, the die travels rapidly toward the tube. As the tube enters the die, the force exerted on the die by the air motor against the stationary tube causes the tube diameter to be reduced for a length of from one to three inches and imparts to it the shape of the carbide insert. Because of the long wearing characteristics of the carbide insert, this die has a life of approximately one million swaging operations.

Carbide Boring Blades Used in In-Line Boring

A component, consisting of two phosphor-bronze bushings cast in an aluminum body, as shown in Figure 2, had to have the bushings internally machined. The inside diameters of these bushings were specified to be held in line to close tolerances. Close limits had to be held on the diameters as well as on out of round and surface finish.

The method adopted for accomplishing this machining was in-line boring. A boring bar with a double HSS blade set up as shown in Figure 3-A was first used. Heat generated by the boring blade making the cut through the phosphor-bronze was not dissipated rapidly enough by the steel blade and the steel boring head, so that a considerable amount of it was absorbed by the bushings. This caused an excessive amount of expansion to take place in the bushings. As the bushings returned to normal temperatures, they contracted to such a degree that the ID of an excessive number of the bushings fell below the allowable limits. Some of them were also knocked loose from their cast-in condition. Also, due to this generated heat, the boring blade would not hold up for boring more than about 50 pieces between regrinds. As the blade dulled, the ID of the bushings developed out-of-roundness and scored surfaces, and production ranged from only 25 or 30 pieces a day up to 75 with an overall- average of 50 pieces.

To improve this operation, a changeover was made to solid carbide blades. Instead of one steel blade, three carbide blades were adopted. Therefore, the only

(Continued on page 87)

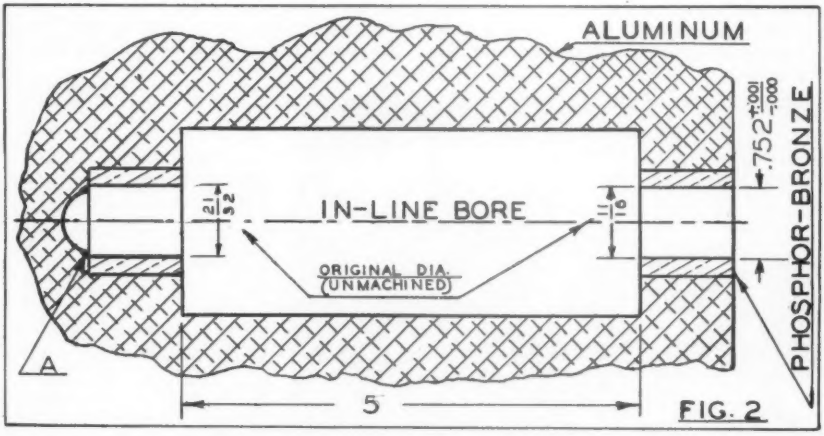


Fig. 2. A section of an aluminum part is shown in which phosphor-bronze bushings have been cast. The problem was to bore the two bushings so that their inside diameters were held in line to close tolerances. Also diameters, out of round and surface finish had to be held to close limits. In-line boring with three carbide boring blades solved the problem.

Light Steel of Controlled Density

by **P. E. Cavanagh**
Ontario Research Foundation
Toronto, Canada

The Ontario Research Foundation has developed a process and methods for producing finished and semifinished articles of steel having any desired density and analysis within a very wide range.

The process itself is extremely simple. Fine iron ore is made directly into the desired steel shape without melting or any other intermediate step. The dry, fine, prepared ore, generally finer than 60 mesh, is poured directly into suitable molds, is then reduced at a temperature of above 2000 degrees F and is finally held for a longer treatment time of several hours at this same temperature.

The resulting article has the composition and structure of normal steel except that it contains a predetermined amount of spherical voids *which are not interconnected.* This point is most important, since the cellular structure of the steel allows it to be heated and hot worked without any great precautions being necessary to prevent excessive oxidation and scaling.

The future applications of this new engineering material have been divided into three classes, according to density. The density of steel is about 7.8 grams per cubic centimeter. Controlled density steel can be produced with any desired density from about 1.0 to 7.2 directly from the furnace.

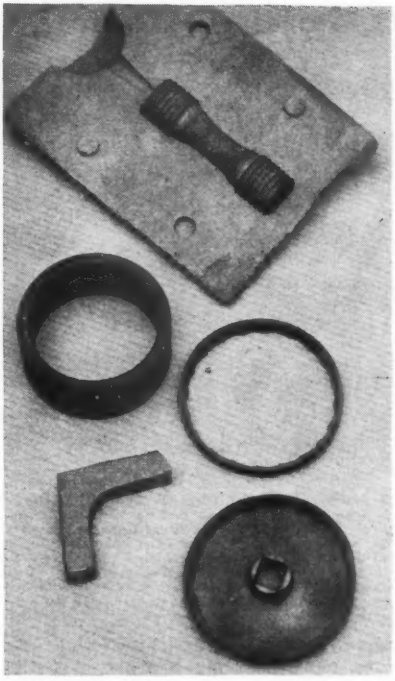
Hot Worked Material

Controlled density steel may be produced with carbon contents ranging from less than .01% up to 1.5%. Alloying additions can also be made to the ore and a wide variety of alloys have already been produced by this method. If the final form of the steel is to be rods, bars or wire, the iron is poured into a paper tube or some type of porous mold such as a Croning sand mold or porous graphite mold. The tubes full of ore are placed in a metal or ceramic sagger which is then filled with a mixture of coke breeze and limestone, and sealed. The loaded container is then heated to 2000 degrees F and held for sufficient time to produce the desired carbon content and density.

The density of the finished article will depend upon the swelling or shrinkage characteristics of the iron ore employed, on the maximum particle size and on the particle size distribution. For hot working, the density of the steel coming from the furnace must be more than 3.0 and is preferably over 4.0.

Comparing specimens of unique light steel are Dr. O. W. Ellis, Director, Metallurgical Department, Ontario Research Foundation; Dr. H. B. Speakman, Director of the Foundation, and at right, P. E. Cavanagh, Assistant Director, Metallurgical Department, who evolved the steel.

Editor's Note: We wish to acknowledge the courtesy and cooperation extended by MACHINE PRODUCTION & CANADIAN MILL SUPPLY, Don Taylor, Editor, in providing this article which appeared in their January 1952 issue. The appended "Additional Notes on the New Light Steel" is from the same source. E. W. P.



Croning mold for tensile test specimens at top demonstrates accuracy of parts molded from the light steel, with shrinkage less than 1%. Large collar is a driving band for an artillery shell, such a part being well suited to this new engineering metal and process. Shown also are two machine components with internal ratchet teeth, molded to finished shape directly from iron-ore powder. Bracket at left indicates a substitution for wood, utilizing light steel of about 1.3 density.

The resulting bars are removed from the saggers after they have cooled to about 100 degrees F. The bars may then be reheated and hot worked by swaging. When reduced in cross sectional area by more than 80% in the hot swaging operation, the tensile properties, elongation, reduction of area and hardness of the bars correspond closely to the mechanical properties of ordinary steel of the same composition in the same stage of processing.

The bars or rods can then be further cold worked and will attain the normal mechanical properties for cold drawn steel bars of the same analysis.

Hot working and forging of other shapes can also be carried on quite easily as long as the shape is totally enclosed on at least four sides during working. The first working must be very gentle, but once a density of 7.5 or more has been obtained, hot working may proceed in the same way as with ordinary steel.

The usual methods of annealing, hardening and subsequently bringing the steel to the desired physical properties are the same as with ordinary steel.

It is believed that the cost of producing such material from controlled density steel will be higher than that of producing ordinary steel bars when the material is produced at the rate of about 20 tons per day from a continuous type of operation. There is no possibility that this process will compete with standard methods of producing steel on a large tonnage basis, but it has interesting possibilities in locations remote from present steel plants, but close to suitable ore. It is also of interest in plants using 10 to 20 tons per

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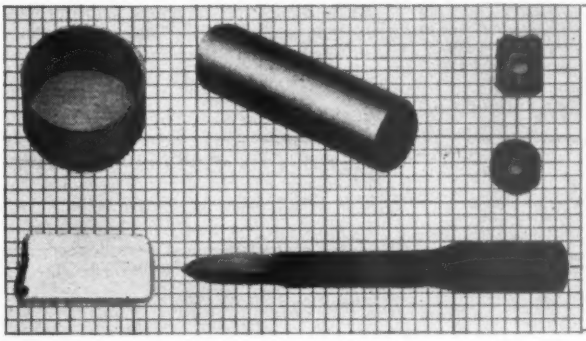


Additional examples showing methods of working the metal which are possible. Top, machined tube and as-molded ring. Forged and hardened knife is shown below, and the two small parts are coined from molded blanks to replace conventional pressed powder-metal parts. White piece at left has been porcelain-enamelled without initial undercoating.

Die and Mold Duplication

There is a basic mechanical difference between plastic molds and die casting dies on the one hand, and a great array of sheet-metal working and miscellaneous dies on the other hand. The important element in the first is cavities, almost altogether. Contrariwise, other dies involve

by **John E. Hyler**

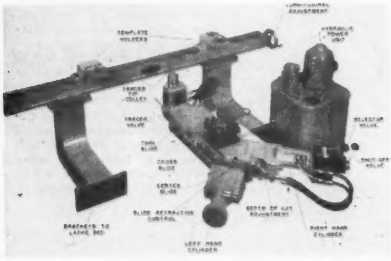
both male and female members.

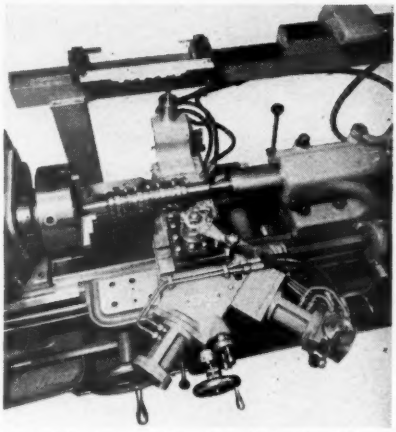
Therefore, the hobbing process, particularly suited to production of various types of cavities, is more extensively applicable to making molds, and offers a method of perfect duplication as far as it goes. However, there are countless tool shops specializing in making molds, die casting dies, etc., in which the hobbing process is not available.

A couple of decades ago, when hobbing was a new art, only relatively small plastic parts were molded. In consequence, a hobbing press did not need nearly the capacity now required in many places. Many tool rooms and tool shops scarcely find it economical to invest in a large-sized hobbing press. In those days, nearly any available press providing necessary capacity might be employed.

Today, a number of leading manufacturers are providing presses particularly designed for hobbing. These range from

Here is seen a dual-slide type of Turchan hydraulic duplicating mechanism, which makes duplication of difficult turning jobs simple, and which can be used to a very considerable extent in making and duplicating dies and molds or their components.





Dual-slide type of Turchan hydraulic follower is seen applied to lathe and in action. A cross slide, equipped with two compounds, mounted at 45 degrees to the center line of the lathe and at 90 degrees to each other, replaces the conventional cross slide. The 45-degree compound movements are controlled through a tracer, while the cross and longitudinal travels are still obtained with a conventional lead screw.

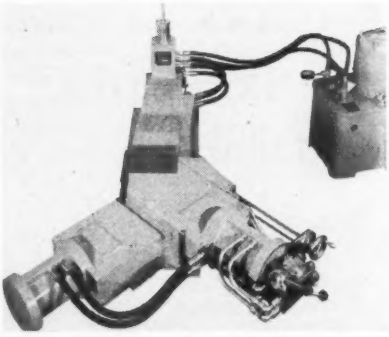
capacities of 100 tons to 5000 tons and over. Some have highly-sensitive control, and are made with a rigid three-column construction.

In addition to hobbing presses suitable for such work, die hobs are obtainable from various sources, where it is found expedient to obtain them outside, rather than making them in one's own shop.

Not All Cavities Hobbable

Aside from the economic aspect, it is true that some cavities *cannot* be hobbed with satisfaction. In some instances, the area of the master hob it is proposed to employ is too great for the capacity of any press on the floor. There are also cases where cavities cannot be hobbed properly because they are of such nature that suitable means can hardly be provided for escape of all metal being displaced.

In plants where many die or mold cavities of a given type must be produced, and where hobbing would ordinarily be resorted to, were it not for the fact that the particular cavities involved are not



Another view of the dual-slide hydraulic duplicator made by Turchan.

practical to produce by the hobbing method, some type of duplicating machine or setup is definitely indicated for use.

It should be remembered, however, that where many duplicate molds are to be formed for plastics, or many duplicate die casting dies are to be made, the hobbing process, where applicable, provides a very fast and economical method of duplication. In the hobbing method, a hardened steel master hob is pressed directly into an annealed steel blank. It is necessary to make the master hob an exact duplicate of parts to be produced in dies or molds to be hobbed. The particular type of steel to be used in making hobs varies, depending on whether hobs are being made for relatively short runs, or whether they are to be used for long runs. In every case, of course, cost is the factor that governs.

In some instances, where it would otherwise be scarcely practical to hob a die or mold cavity, the situation may be ameliorated by machining part of the metal away roughly and preliminarily. On the other hand, it is always necessary to avoid thin sections in making a hob, because such will inevitably break down under high pressures involved. In this connection, cavities can sometimes be hobbed with regard to the greater part of their inner contour, *after* which any thin slots or cuts involved may be machined or engraved in those cavities.

Radii on Hob Corners

Care must be observed, in fact, to eliminate all possibilities of hobs breaking down at any point. To this end, all corners on hobs should be provided with at least a small radius. Draft (or a small amount of taper) should be provided on all side walls of the hobs, so they will be readily removable from cavities they have formed. Otherwise, a hob may be broken in the process of pulling it out of the cavity it has formed.

Some cavities are not amenable for hobbing because they have one strongly inclined and one relatively straight side. In such a case, a hob will tend to crowd sidewise under the tremendous pressure placed upon it; hence the cavity will not be an equal but opposite replica of the hob.

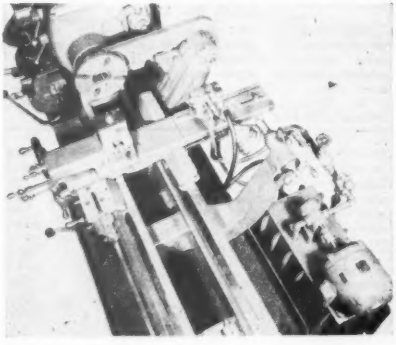
So far as possible, therefore, opposite walls on hobs should be made with equivalent angles. Where this is not possible, it is sometimes found reasonable and expedient to make hobs in pairs, and to have them oppositely arranged with reference to their wall angles. In this manner, the excess angle on the side of one will offset that on the other.

When a mold blank is being hobbed, it is quite commonly enclosed in a strong retainer ring, the ring being used to prevent the steel from expanding and splitting or cracking at any point. Such retainer rings are made in different sizes. They are made as strong as it is possible to make them within the bounds of consistency. Nevertheless, they occasionally break under the tremendous pressure involved.

Breakage of retainer rings used in hobbing allows particles of steel to fly in any

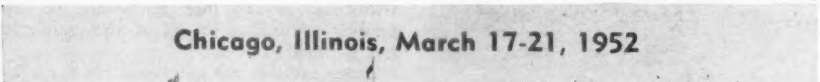
(Continued on page 128)

Top view of a Springfield lathe equipped with hydraulic follower mechanism, enabling reproductions to be made on dies and molds.



PICTORIAL PREVIEWS of the 1952 ASTE INDUSTRIAL EXPOSITION

Chicago, Illinois, March 17-21, 1952



In a few days the doors of Chicago's International Amphitheatre will open on a wealth of tooling products and tooling ideas. Nearly 400 exhibitors will be set up to show you their newest and best. The following columns give the names of the exhibitors and their booth locations throughout the two floors of the building.

Exhibitor	Booth No.
Accurate Bushing Co.	838
Ace Drill Corp.	144
Acme School of Die Design Engineering	644
Acme Steel Products Div.	
Acme Steel Co.	1226
Acme Tool Co.	128
Adamas Carbide Corp.	1301
Affiliated Screw Products	708
Alemite Div.	
Stewart Warner Corp.	204
Allegheny Ludlum Steel Corp.	1218

Allen Mfg. Co.
Booth No. 116

On Display: ALLEN HEAD socket, set and cap screws, shoulder screws, dowel pins and Allenuts.

In Attendance: Willis Horner, Henry Michgelson, George Ullring, Ben Stair, George Newton, William Hensel and Charles Schnell.

Allied Products Corp.
Booth No. 225

On Display: An extra heavy duty series of punches for piercing ⅝" or heavier plate; new tooling to insert type H Clinch Nuts simultaneously with other production steps; and other R-B punches, dies and retainers.

In Attendance: Lee Coulter and other Allied officials.

Allis-Chalmers Mfg. Co.	1728
The Allison Co.	1204
Alpha Corp.	706
American Cystoscope Makers, Inc.	825
American Machine & Foundry Co.	1131
American Pullmax Co.	1943
American SIP Corp.	1917
B. C. Ames Co.	605
Ampco Metal, Inc.	1119
Anchor Coupling Co., Inc.	304
Anderson & Sons, Inc.	834
F. E. Anderson Oil Co.	1309

Exhibitor	Booth No.

American Wheelabrator & Equipment Corp.
Booth Nos. 1213, 1215

On Display: New Model 43 Liquamatte wet blast machine (illustrated); photos of machines for cleaning and peening; and typical parts that have been cleaned and shot peened.

In Attendance: Otto A. Pfaff, John A. Silver, A. E. Lenhard, S. S. Deputy, L. J. Wieschhaus, R. M. Rich, J. H. Thomson, R. L. Orth, G. R. Bryant and V. S. Spears.

Angier Corp.	141
R. B. Annis Co.	614

Arrow Tool & Reamer Co.
Booth No. 117

On Display: End mills, live centers, subland drills, reamers, counterbores, carbide-tipped and HSS special cutting tools.

In Attendance: Richard H. Wolfe, Robert H. Wolfe, B. J. Fox, N. J. Fisher and H. B. Gunderson.

(Continued on page 76)

HIGH PRODUCTION SETUP

ON CINCINNATI NO. 1-18 AUTOMATIC

nets 800 parts per hour

Production ideas are never tied down to one part in a specific product. Take the setup illustrated here, for example . . . it could be employed with equal effectiveness for defense work. ¶ A CINCINNATI No. 1-18 Plain Automatic is equipped with two air operated fixtures to mill flats on the ends of laundry machine roller shafts. The operator merely places two parts in the fixture and removes them after they are milled; a touch of the air control button clamps and unclamps the work.

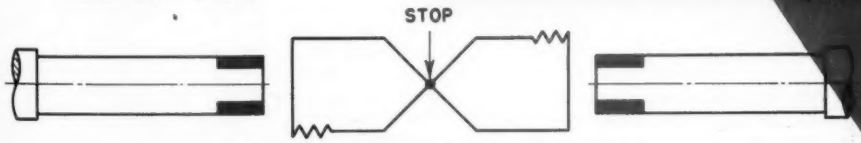
These labor-aiding fixtures, and the 1-18's fast automatic cycle with a midway safety stop, enable the operator to produce 800 parts per hour.

Small automatics built by Cincinnati are your best bet for quick relief of production pressure resulting from a backlog of milling operations on small- to medium-sized parts. Complete information about CINCINNATI No. 1-18 Plain Automatics will be found in catalog M-1555-2, available at no obligation.

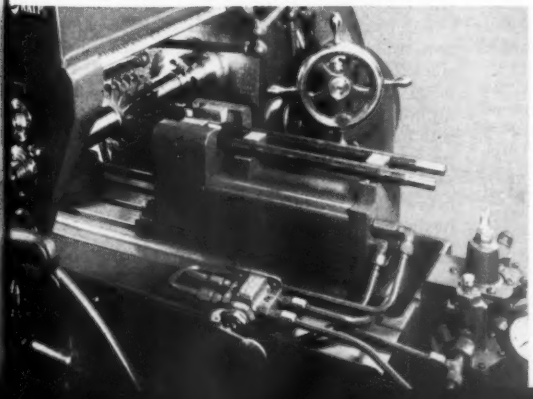
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



Drawing shows milled ends of parts, and automatic cycle.



PRODUCTION DATA

Part name	Shaft
Material	Steel
Operation	Straddle mill flats on end
Cutting speed	83 feet per minute
Feed	5⅜" per minute
Production	800 per hour

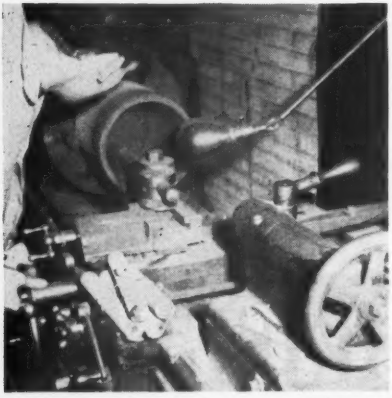
800 shafts per hour are milled on this CINCINNATI No. 1-18 Plain Automatic, equipped with labor-aiding fixtures designed by Cincinnati Application Engineers.

. . . Light Steel, from page 69

day of steel who may find it advantageous to have their own closely controlled source of raw material, such as bar stock, tubing or sheet.

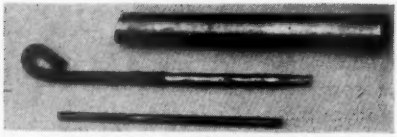
Substitute for Iron Powder

Controlled density steel in the range from 4.0 to 6.5 can be produced with about the same mechanical properties and composition as pressed iron powder products.



Machining a sagger made of controlled-density steel, at the Ontario Research Foundation. Metal can be machined with high speed steel tools. Sagger being made will give coating of special heat resisting enamel, and will withstand temperatures exceeding 2000F., another unusual feature of the steel. The metal can be welded by arc or oxy-acetylene and can be worked similarly to conventional steel after hot swaging. Parts can be molded to finished or semi-finished shape.

In this field the process is in direct competition with powder metallurgy. Its use is attractive where the parts being produced do not require machining after coming from the furnace. This means that such intricate parts as gears could not be made at a competitive price by this process as compared to pressed and sintered powder gears. The tolerances on the parts as produced are not of the order of pressed powder tolerances, but rather in the range of casting tolerances. The process should be regarded as a "casting" method, since many parts can be produced from molds which could not be pressed from powder. Where molds can be designed to be filled with dry ore powder,



Light steel bar of 4.5 density shown at top has been hot worked by swaging to produce bar in center view, which sustained a cold bend of about 180 degrees. Bar at bottom has been given additional cold working.

steel parts can be produced which require about the same amount of finishing as a cast iron or cast steel part.

In production of such simple shapes as bands, rings, bars, etc., the controlled density steel process gives lower costs than powder metallurgy methods where the amount of finish machining to be done is low and especially where required dimensional tolerances are not rigid.

Light Steel

Light steel would seem to be a suitable name for the third class of controlled density steel products. In the range of densities between 4.0 and 1.0 the main advantages of the material are its very low cost compared to other light weight metals and the fact it can be produced directly from the furnace to reasonably close tolerances.

In all cases the tensile strength of the material decreases with decreasing density. At a density of about 1.3 the mechanical properties compare with those of wood. At densities of 2.5 to 4.0 the tensile strength is increased to about 15,000 or 20,000 psi. The ductility and impact strength are low.

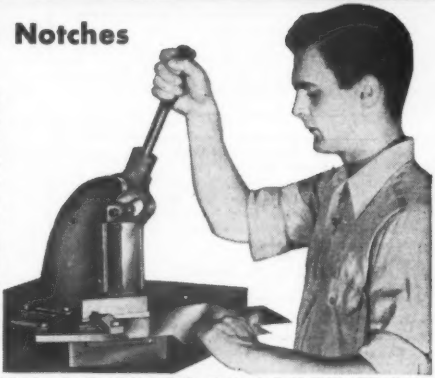
By proper preparation of the ore, shrinkage can be controlled to less than 1%. Particularly in cases where low cost and light weight are the main considerations, light steel can replace plastics, wood and, in some cases, magnesium and aluminum. Redesign of some parts is worthwhile to provide more material to withstand the required loading since the cost of the resulting part may be far below the cost of a corresponding magnesium or aluminum part. Light steel is

(Continued on page 78)

THE di-acro NOTCHER

Duplicates Precision Notches WITHOUT DIES!

The new precision DI-ACRO Notcher is so fast and easy to operate that it is no longer necessary to invest in dies and set up a punch press for many production notching operations. It can be so quickly adjusted for any size or shape notch within its capacity that it is also ideal for experimental or research work. Many straight shearing operations are also possible with this unit.



CUTS CLEAN—NO BURRS OR ROUGH EDGES

The powerful action of the DI-ACRO Notcher results from an exclusive DI-ACRO designed roller bearing cam which provides a tremendous pressure with a small amount of effort. The precision-ground Vee-shaped ram and blades of alloy tool steel assure clean cuts and permanent accuracy in production runs of duplicated notches.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 72

Exhibitor	Booth No.
Armstrong Bros. Tool Co.	133
Aro Equipment Corp.	1810
Arrow-Hart & Hegeman Electric Co.	2042
Atlas Press Co.	1510
Atrax Co.	1722
Austenal Labs., Inc.	552
Eric R. Bachmann	1817
Barnes Drill Co.	1808
W. O. Barnes Co., Inc.	1300

E. A. Baumbach Mfg. Co.
Booth No. 1714

On Display: Die sets—present and past—diemakers' supplies, and a series of catalogs portraying the growth of the stamping industry.

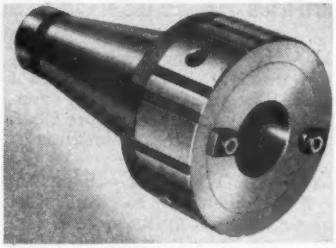
Bausch & Lomb Optical Co.
Booth No. 813

On Display: Contour measuring projector, toolmaker's microscope, shop microscope, Brinell microscope, wide field binocular microscope, Balcrometer (3" thickness measure) and microscope body tubes.

In Attendance: M. H. Stevens, P. M. Stoehr, M. Seelinger, J. H. Mead, E. G. Koch and R. E. Neukom.

Bay State Abrasive Products Co. 409

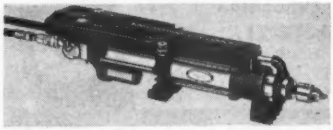
Beaver Tool & Engineering Corp.
Booth No. 1219



On Display Quick-change tool holders (illustrated), adapters and boring bars.

Beckett-Harcum Co. 1116

The Bellows Co.
Booth Nos. 1424, 1428

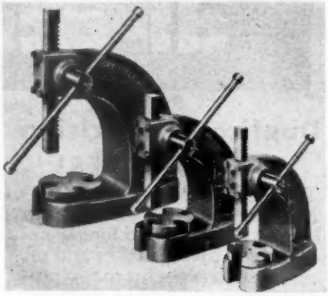


On Display: The Hydrair (illustrated), a new electronically-controlled, air-powered drilling device; a new drill press feed; a new dial feed; and a new air-powered shuttle fixture.

Bendix Westinghouse Automotive Air Brake Co. 1717

Exhibitor	Booth No.

Benchmaster Mfg. Co.
Booth No. 1805

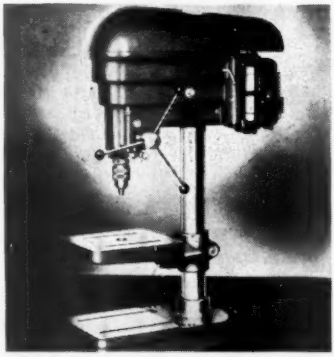


On Display: New line of arbor presses (illustrated) horizontal and vertical mills, and punch presses.

In Attendance: G. F. Florence and M. K. Grey.

Bijur Lubricating Corp. 641
Black Drill Co. 446
Edward Blake Co. 1711
Henry P. Boggis & Co. 1709

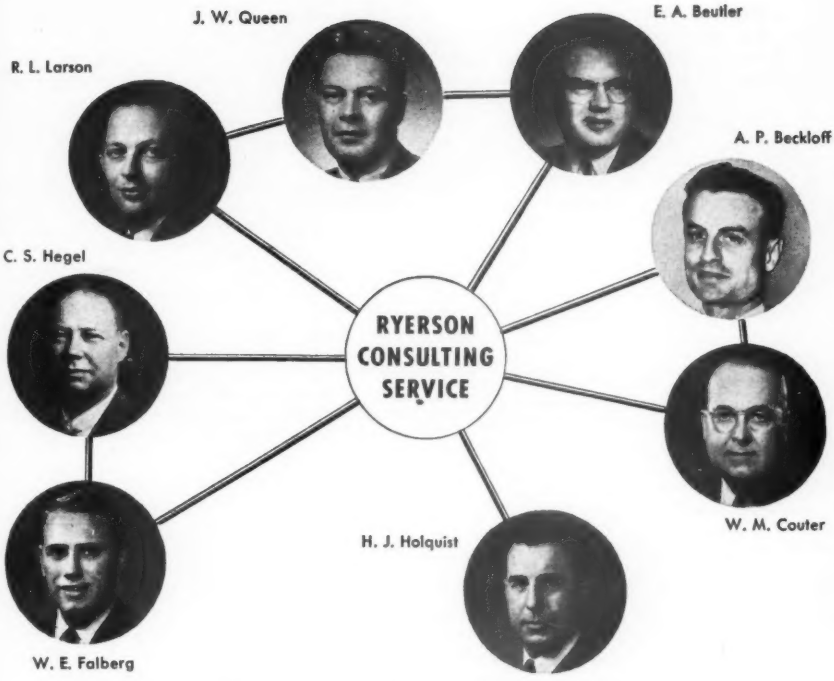
Boice-Crane Co.
Booth No. 136



On Display: Various models of 14" band saws; new ½" capacity 15" drill presses (illustrated); and ⅝" capacity drill presses.

Bokum Tool Co. 121
Boyar-Schultz Corp. 1438
The Brinnell Co. 1916
The Bristol Co. 311
British Industries Corp. 1205
Charles Bruning Co., Inc. 746
The Brush Development Co. 821
Bryant Chucking Grinder Co. 604

(Continued on page 96)



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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Light Steel, from page 74

fireproof, does not warp or split and can be soldered, welded, painted and plated. The material also takes an excellent porcelain enamel coating with no preparation or undercoating. It will bond, during manufacture, to steel, refractories and abrasive materials. At the very low densities, wood screws can be driven into it by hand, and it can be cut and worked with ordinary wood working tools.

The cost of light steel parts compares with the cost of the same part made of malleable iron.

Processing Procedures and Development

Work started on this process in May, 1951. The laboratory phase of the investigation has been completed and an exploratory pilot run is now under way in an electrically heated tunnel kiln 65 feet long. The purpose of this first phase of the pilot operation is to explore the possible applications of the process. The next stage will be to get accurate production rates and costs.

It will be readily understood that other methods of reduction are quite practical. For example, extruded bars of iron oxide may be reduced in hydrogen or other reducing gases. If a very low carbon content is desired, hydrogen is, of course, the preferred reducing agent. Reduction can also be carried on in a belt type furnace if the ore is in a porous mold which will support this shape as it is reduced in the furnace. Other metal oxides can also be processed in the same manner to produce shapes, finished and semi-finished articles of the resulting metal.

It is believed that this process will find a place as a supplementary method of producing many useful articles of steel. When parts as produced from the furnace are used directly without further hot or cold working, it is possible to use iron ores containing large amounts of impurities which prohibit their use in normal steel-making processes. Since the metal never passes through a liquid stage, it is only necessary to keep such impurities as silica down to an acceptable level for the end use of the article. In the case of such impurities as sulphur, phosphorus, titanium, nickel and chromium, the allowable limits of these elements will be determined by the required mechanical properties of the finished article and not by their deleterious effect on the hot working properties of the steel.

These facts make it possible to consider the use of many ores for the controlled density steel process which cannot be used in the standard steel-making operations.

The object of the Ontario Research Foundation is to develop the process on a sound basis and to get it into use as soon as possible in industry. Discussions with companies interested in obtaining licenses to operate the process are under way.

This work has been conducted under the aegis of one of the Advisory Committees of the Ontario Research Council and has been supported by funds from the Provincial Government of Ontario.

Additional Notes on the New Light Steel

Numerous Applications

A good many applications of this new metal are already indicated, and the extent to which the metal and process will be used in the future is bound to be considerable. Actually, the development must be looked upon as consisting of two separate phases: first, the new steel itself, which can have its density or "weight" controlled as desired; and secondly, as a new "forming" process for the reduction of finished or semi-finished components. In this latter respect, the process competes favorably with powder metallurgy as a manufacturng method.

Steel with a density of 1.0 to 7.2 can be produced directly from the furnace without hot working, although the latter is necessary to attain higher physical properties if required. By comparison, magnesium has a density of about 1.74 (1.74 grams per cubic centimeter); conventional steel, 7.80, and aluminum 2.56. In the lower ranges of density or the lighter grades by this method, the metal should not be regarded as steel in the usual sense, since it is impossible to have a steel of this low density and the usual tensile strength at the same time.

The process is not designed to replace present methods of making steel, but

(Continued on page 82)

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Sixth Annual Quality Control Convention

Greatly increased use of the techniques of Statistical Quality Control demanded by Armed Forces procurement agencies, plus an outstanding program of speakers and exhibits, are expected to attract a record attendance at the 1952 Sixth Annual Convention of the American Society for Quality Control, to be held in Syracuse, N. Y., on May 22, 23 and 24.

The society, a young and vigorous organization of inspection, production, management and educational leaders, had an attendance of more than 2000 persons at its 1951 convention in Cleveland.

Three luncheons and a banquet, all served at the new Onondaga County War Memorial Auditorium (convention headquarters) by the combined staffs of the city's two leading hotels, will give those attending the convention an opportunity to hear several outstanding industrialists discuss quality control and its applications.

Under the general chairmanship of Leon Bass, General Electric Co., Electronics Park, Syracuse, the program has been planned to provide technical discussions and papers in the following fields:

Aircraft and aircraft industries, automotive, die stamping, electronics, gaging and gage laboratory, mathematical statistics, precision manufacture, receiving and inprocess inspection, Armed Forces procurement, chemical, education, food, management, office and accounting, pulp and paper, steel foundry and fabricating, and vendor certification.

In addition to extensive coverage of the above subjects, as well as material of general interest to anyone of a receptive frame of mind, it is again possible to present 11 hours of instruction in the basic principles of the quality control idea. Anyone who can add and subtract will find this part of the program well within his grasp.

The exhibits will include those of many of the country's foremost manufacturers showing important phases of quality control activities in their operations, as well as most of the outstanding gage companies displaying the latest and best.

Several of the fields listed above are considered by the Society to be of interest to so many people that there have been formed corresponding technical committees composed of representatives of the particular industry or occupation.

One of these committees, the Electronics Technical Committee, of which the chairman is also Mr. Bass, has focussed its attention recently on the problems of standard quality criteria for mass produced electronic parts. The aim of this study is to provide uniform quality standards throughout the industry, acceptable to both vendor and purchaser, beginning with such items as resistors, condensers, tubes, audio transformers, power transformers of less than 1000 watts, and other such fundamental electronic components.

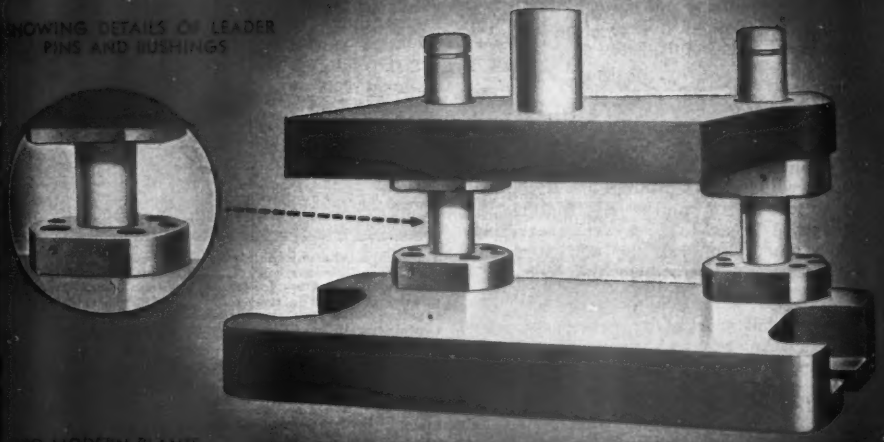
The standard used would be based on the statistical concepts of a recognized and proved sampling plan similar to that incorporated in Military Standard 105A or the plan proposed by the RTMA, R12 Committee. It is proposed that the vendor issue an outgoing inspection certificate covering all characteristics which will be accepted by the purchaser without incoming inspection. This should result in a drastic reduction of inspection costs and in increasing confidence between the buyer and the seller. Obviously, free exchange of information on process averages of observed defects must be anticipated.

To investigate the feasability of this plan, the Committee submitted a questionnaire to a randomly selected sample of the electronics industry. The replies indicated such general interest in the proposal that the Society has scheduled a portion of its convention program in Syracuse for the presentation and discussion of this idea in detail. Meanwhile, the Committee will hold a meeting in New York City early this month, with representatives of those organizations that answered the questionnaire to select sub-committees to formulate plans for the various components.

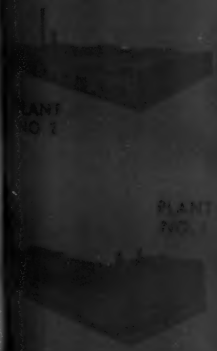
The fact that more than 40 booths have already been sold indicates the possibility of the largest exhibition in the history of the Society. Exhibits will be open all of the three days to those attending the convention. Besides manufacturers of gaging and inspection equipment, calculating machines, precision production tools, etc., there will be exhibitors of consumer goods. These include Carrier Corporation, Ford Motor, General Electric and Sylvania Electric Companies.

NO OTHER DIE SETS LIKE BAUMBACH

NOWING DETAILS OF LEADER PINS AND BUSHINGS



O MODERN PLANTS TO SERVE YOU



Because of the patented demountable leader pins and bushings which are hardened, ground and super finished for accuracy and durability.

Baumbach precision built die sets have been serving industry for 40 years and through better quality and prompt service have become the foremost producer of die sets.

An important advantage of baumbach die sets is our method of fastening the leader pins and bushings to the die shoes and punch holders. Other cost cutting features are the ease of regrinding, counterboring or machining. Fit leader pins to your ways.

Write for catalog B-50. It contains much valuable information about die sets.

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. . . Light Steel, from page 78

rather to supplement them. It can be used to provide "custom-made steels" of any density right at the manufacturer's own plant, or to provide an additional source of supply. Equipment for its production is relatively simple, although the cost due to hot working and labor is higher. If the metal is to be used in the "as-molded" condition, it is possible to use ores with greater amounts of impurities than can be employed in making steel in the usual way. It can be regarded as a highly convenient "casting" or forming method for parts not requiring much machining afterwards. The low shrinkage—less than 1%—is of special significance.

Application of Light Steel

When used as a light steel, the costs are lower than for other light metals such as aluminum and magnesium. It can be used to replace wood and synthetics in many cases, while still retaining the advantage of a metal. It can be electroplated or otherwise treated to prevent corrosion. At a density of 1.3, the new steel can be processed with wood working tools.

Physical Properties

When hot worked as previously mentioned, the physical properties—tensile strength, ductility, reduction of area, etc.—are attained to a degree similar to those of a conventional steel which has been similarly worked.

Tensile strength increases with density. Raising the density from 2.5 to 4.0 increases tensile strength to about 15,000 to 20,000 psi. Micrograph structures of the hot worked steel resemble those of conventional steels. Ductility of hot worked steel is comparable. A ½-inch hot worked bar, for example, worked to the same density and properties as 1045 SAE steel, can be bent cold to a 180-degree bend.

Hardening Qualities

Controlled density steel can be hardened to the same degree of hardness as ordinary carbon steel of the same carbon content, and hardenability—depth of hardening—is comparable. For example, experimental tool bits made of .85% carbon content and given a water quench had a resulting hardness of 62 Rockwell C. Oil quenched specimens of 1.0% carbon showed hardness on the order of 57 Rockwell C.

Simplicity inherent in the new steel-making process is indicated by P. E. Cavanagh, Assistant Director of the Ontario Research Foundation. Iron powder is placed in tube-molds, ready for sealing, together with coke breeze and limestone in the containers or saggers shown.

Machining Qualities

In machining the hot worked material a continuous chip is produced as with steel, and it machines in similar manner. Free machining bars are also being produced—to have properties similar to SAE 1112, for example—in additional development work. A notable advantage in making such free machining steel is that the ore powder employed has the abrasive silicon removed by means of a special magnetic ore concentrator. Welding characteristics appear to be similar to those of steels of the same density and degree of mechanical working.

Numerous molded or "cast" parts have been produced to test shrinkage and dimensional properties. Possibly this new steel-making process will find its widest application as a manufacturing method—directly from iron powder to finished or semi-finished article.

It is possible to visualize a continuous steel-making process which would employ continuous extrusion for hot working the metal when bar stock, is to be produced.

NEW! SUPERIOR "Removable Cap" GUIDE PINS

End Troublesome Binding In Die Set Assembly Work . . .

Cut away view of NEW Superior Removable Guide Pin shows its practical construction.

HEXAGON KEY REMOVES CAPS TO FREE PUNCH HOLDER . . . DIES PART QUICKLY and EASILY

It is no longer necessary to spend excessive time in assembling and disassembling large die sets! Superior's *NEW* Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes. As a result overall die costs are substantially reduced. Complete information is available on request. Save by using these advance type guide pins in your die sets. Write, phone or wire your needs now!

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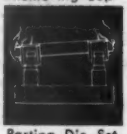
4. Designed for use on all die sets.
5. One man can remove large punch holder in approximately 3 minutes.
6. Punch holder assembled easier and more accurately.
7. Guide pins are precisioned machined and finished for long wear.
8. Taper seat for cap insures positive alignment.
9. Damage to costly dies in assembly and disassembly is eliminated.

Removing Cap



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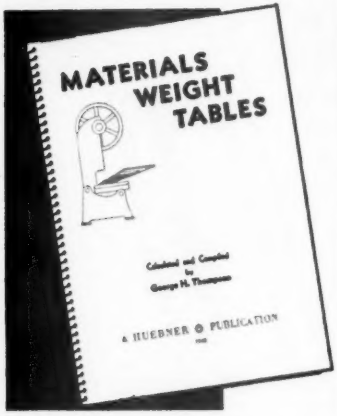

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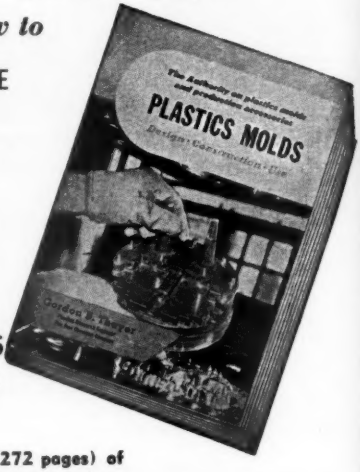

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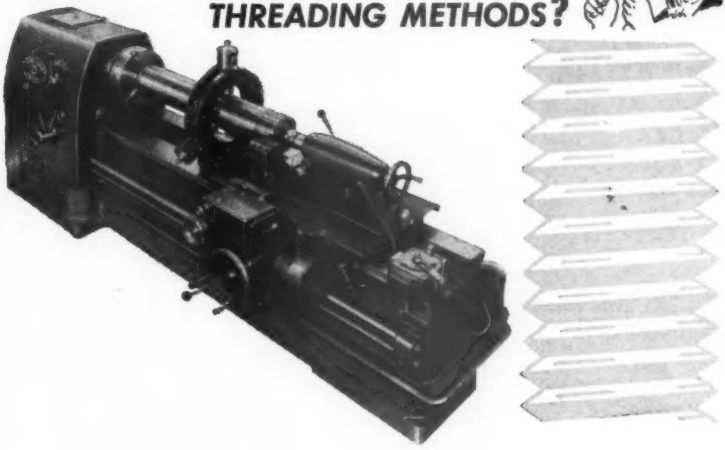

FACTS ABOUT THE CRI-DAN MODEL "D"

SPECIFICATIONS

Motor requirements	15 HP
Spindle speed (24 speeds),	100-1200 RPM
Swing over saddle	12"
Swing over bed	21"
Capacity between centers	60"
Maximum length of thread	5¼"
Max. exter. diam. of thread	12"
Max. inter. diam. of thread	16"
Maximum depth of thread	.250
Multi-start threads	Up to 12 starts
Taper threads	30° incl. angle
Length of machine	12'0"
Width of machine	3'7"
Height of machine	4'6"
Approx. weight of standard machine	6900 lbs.

Learn about the New CRI-DAN "D" —the largest of the CRI-DANS

The CRI-DAN "D" is the newly introduced "big brother" to the CRI-DAN "B" which has been setting new records in threading economy and accuracy.

The CRI-DAN'S remarkable economy is accomplished by reduced threading time, the use of a single point carbide tool and fast changeover.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

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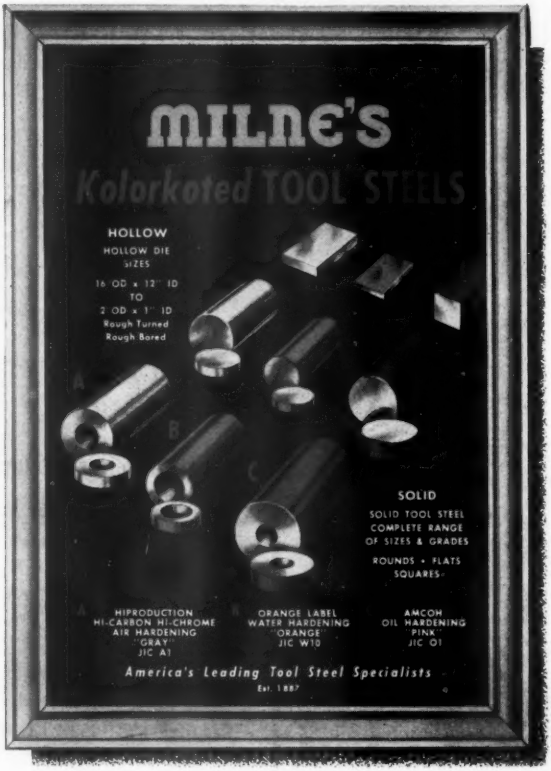
2 Heat treat card of color to match Kolorkote on steel goes with every shipment . . . eliminates errors.

3 Hollow Die Steels with smooth finish inside and out, no scale, no decarb . . . minimize machining, reduce waste. Saw cut to length.



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Complete Line Of Tool Steels

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. . . Carbide Tooling, from page 67

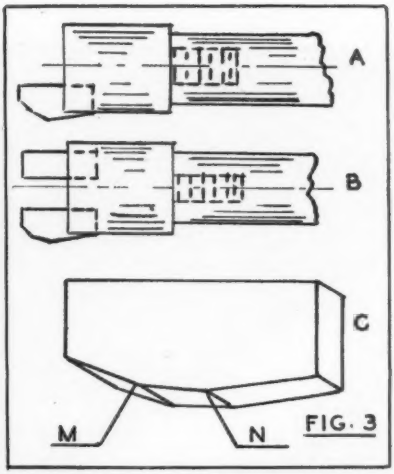

Fig. 3. A double HSS blade mounted as shown at "A" was first used in the operation shown in Figure 2, but did not produce satisfactory results. Three solid carbide blades mounted in the boring head as shown at "B" with the cutting edges tapered as shown at "M" and "N" stepped up production and reduced rejects.

additional change made was in the boring head which was designed to take three blades as indicated in Figure 3-B. The required bushing ID was .752" as shown in Figure 2. The carbide blades were designed to cut on a taper, i.e., point M, Figure 3-C, cuts a diameter of .748" while point N cuts .752", so that the cutting edge extends from M to N.

After two months of continuous operation, the original carbide blades have not been removed for regrinding and the only attention they have required has been a slight honing to remove aluminum which has baked on the blades as they cut into the aluminum casting at A, Figure 2.

Carbide Cutters Used on Wire Stripper

In the assembly of automobile radio antennae, a lead-in wire is used which is made up of a strand of wire, layers of insulation, a layer of wire mesh shielding, and an outside layer of insulation in the form of loom. To one end of a length of this cable a plug is attached by soldering. It is necessary to strip a short section of the loom and the wire mesh from the cable to make the soldered connection. To facilitate this operation, a stripping machine and a cutting machine are employed. The cutting machine cuts the shielding by utilizing a pair of rotating carbide blades. These blades are set up in the cutting machine in such a manner so that as the blade assembly revolves, centrifugal force separates their cutting edges and permits the insertion of the loom for cutting off the shielding. As the operator steps on a foot pedal, the blades advance inward a predetermined distance so that the blades just penetrate through the wire mesh.

The carbide blades are designed with a cutting edge on each end. One edge is used at a time, giving tool double life.

Vibrator Counterweight

Taking power from the storage battery of an automobile for car radio operation is the function of the vibrator. It is the instrument which converts the direct current of the battery to alternating current for radio operation and makes possible the step-up in voltage through the transformer. The parts going into the vibrator have to be precision made to give satisfactory and lasting service.

One of the components of the vibrator is the reed counterweight shown in Figure 4. Radiart has a very ingenious method of attaching this counterweight to the reed. Originally the weight was designed with two holes punched through the part to provide a means for riveting it to the reed. This entailed a rather intricate assembly operation because of the smallness of the weight and the rivets; the weight measuring 9/16" x ¼" x 3/32".

By redesigning the weight and the stamping die, accuracy of assembly was insured, small rivets were eliminated and another cost reduction was accomplished.

It will be noted in the cross-section view, Figure 4-B, that instead of the metal being punched through to create rivet holes, it is displaced to a point just before shearing takes place. Thus the metal protruding beyond the surface of the part, Figure 4-C, serves as the rivets for attaching it to the reed. Figure 4-D shows the opposite surface of the weight indicating how the metal is indented. The shaded section shown in Figure 4-D indi-

(Continued on page 110)

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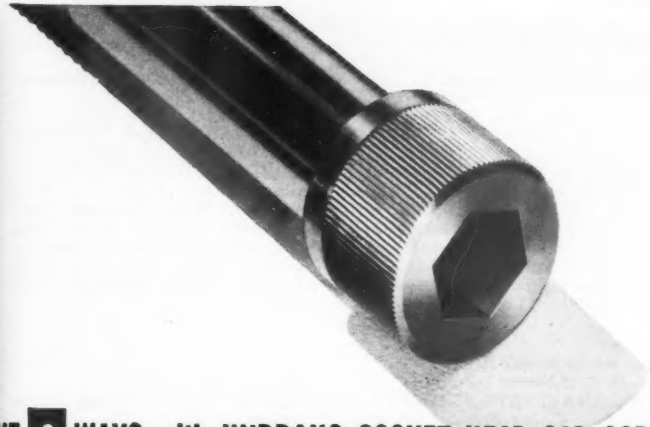

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Since a ¾" UNBRAKO Socket Head Cap Screw is as strong as an ordinary carbon steel screw of ½" diameter, you save in weight and cost by using UNBRAKO. And because smaller diameter screws require less space, they permit more compact designs.

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CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Chicago Programs, from page 65

AFTERNOON (Stockyards Inn)

1:30 P.M. Chairman: **R. E. Bodendoerfer,** Purchasing Agent, J. M. Nash Company.
"DIE DESIGN FOR METAL BLANKING," by **R. C. Berliner,** Owner, C. B. Cash Mfg. Co.

2:05 P.M. Chairman: **C. E. Miller,** Sales Engineer, Schlitt Industrial Supply Company.
"DIE DESIGN FOR METAL DRAWING," by **C. R. Cory,** Engineer, Chg. Die Engineering, Fisher Body Division of General Motors Corporation.

2:50 P.M. Chairman: **E. J. Kane,** Chief Tool Designer, Sangamo Electric Company.
"SELECTION AND TREATMENT OF DIE STEELS," by **Dr. S. G. Fletcher,** Chief Metallurgist, Latrobe Electric Steel Company.

3:30 P.M. **PANEL DISCUSSION: "METAL STAMPING DIES AND OPERATIONS"**
Moderator: **S. H. Ericson,** Chief Tool Engr., American Flange & Mfg. Co., Inc.; **Vasil Georgeff,** Chief Engr., Danly Machine Specialties, Inc.; **Walter Gulliksen,** Supt., Worcester Pressed Steel Co. (representing Pressed Metal Institute); **H. F. Jahn,** President, B. Jahn Mfg. Co. (representing National Tool & Die Manufacturers Association); **P. F. Rehner,** Mgr. of Sls., Carbide Div., Allegheny Ludlum Steel Corp.; **E. J. Reitler,** Sales Engr., Firth Sterling Steel & Carbide Corp.; **Ralph Weisbeck,** Chief Engineer, Wales-Strippit Corporation.

EVENING

8:00 P.M. **Red Lacquer Room, Palmer House**
Chairman: **H. G. Heimann,** Industrial Engineer, Clearer Brooks Company.
"MACHINING AND HEAT-TREATMENT OF BORON STEELS," by **J. D. Graham,** Works Metallurgist, Farm Tractor Division, International Harvester Company.

8:00 P.M. **North Ballroom, Conrad Hilton Hotel**
Chairman: **R. W. Lund,** Sales Engineer, Sterling Grinding Wheel Division.
"SAND CASTING WITH CRONING PROCESS SHELL MOLDS," by **Richard Herold,** Mgr., Foundry Products Department, Chemical Division, The Borden Company.

8::00 P.M. **Normandy Lounge, Conrad Hilton Hotel**
Chairman: **C. A. Woodcock,** Chief Engineer, John W. Hobbs Corporation.
"NEW PRECISION PERFORMANCE SPECIMENS FOR SURFACE FINISH CONTROL," by Dr. **C. R. Lewis,** S taff Engineer, Chrysler Corporation.
"THE SURFAGAGE—AN INSTRUMENT FOR ROUGHNESS MEASUREMENT," by **A. F. Underwood,** Head; **J. B. Bidwell,** Asst. Head; and **J. H. Brems,** Res. Engr., Mechanical Engineering Dept. No. 5, General Motors Research Laboratories Div., General Motors Corp.

Thursday, March 20th GRINDING AND FINISHING DAY

MORNING (Stockyards Inn)

9:00 A.M. Chairman: **D. H. Brighton,** Staff Engr., Planning Dept., Caterpillar Tractor Co.
"THE FUNCTIONS OF CUTTING FLUIDS IN MODERN HIGH SPEED MACHINING," by **H. A. Erickson,** Chief Engineer, D. A. Stuart Oil Company, Ltd.

9:00 A.M. Chairman: **R. W. Bayless,** Supervisor, Education and Training Department, Caterpillar Tractor Company.
"PRODUCTION GRINDING OF CYLINDRICAL PARTS REQUIRING EXTREME PRECISION," by **James Meehan,** Sales Division, and **A. E. Mandeville,** Application Engineer, Brown & Sharpe Manufacturing Company.

9:00 A.M. Chairman: **D. I. Hartter,** Scheduling Manager, Caterpillar Tractor Company .
"CUPOLA DEOXIDATION IMPROVES MACHINABILITY OF IRON CASTINGS," by **F. S. Kleeman,** Consulting Engineer.

AFTERNOON (Stockyards Inn)

1:30 P.M. Chairman: **J. O. Knight,** Factory Manager, L. R. Nelson Manufacturing Co., Inc.,
"AUTOMATIC SIZE CONTROL IN FINISH GRINDING," by **W. E. Moody,** Sales Engineer, Bay State Abrasive Products Company.

2:05 P.M. Chairman: **W. H. Logue,** Staff Engr., Planning Dept., Caterpillar Tractor Co.
"PRECISION PRODUCTION GRINDING," by **B. H. Work,** Asst. Sales Mgr., Bonded Products & Grain Division, The Carborundum Company.

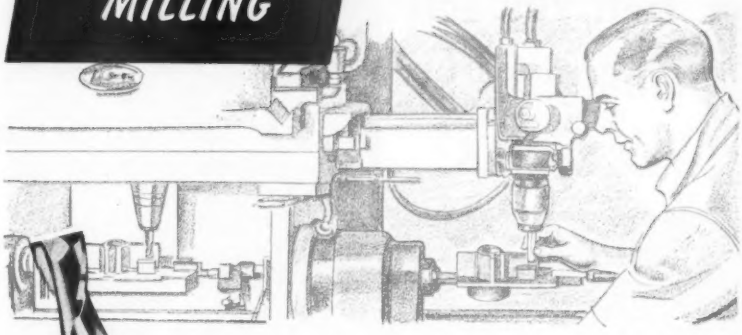
2:50 P.M. Chairman: **Gordon Swardenski,** Planning & Tooling Mgr., Caterpillar Tractor Co.
"FINISH GRINDING TROUBLES AND REMEDIES," by **A. W. Tood,** Assistant Chief Engineer, Van Norman Company.

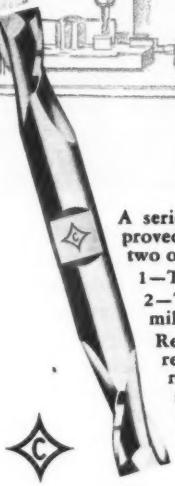
(Continued on page 116)

Here's a tip on . . .

HIGH SPEED MILLING

WITHOUT LOSS OF SURFACE FINISH





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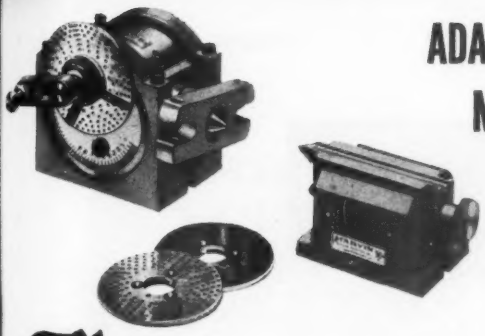

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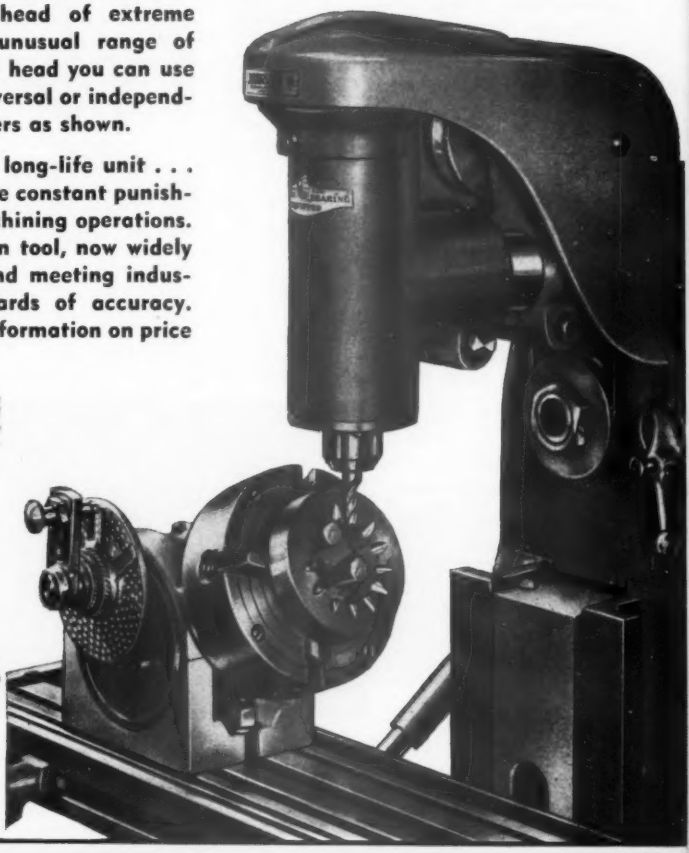
Illustrated at the right is the Marvin Dividing Head in operation with the new Marvin Vertical Mill attachment for bench millers.



MARVIN MACHINE PRODUCTS, INC.
414 FORD BUILDING
DETROIT 26, MICH.

. . . Reo Tooling, from page 63

Fig. 3. Lengths of reel knife stock are set in the slot of this die and are bent to bow shape by the punch as they are held on edge.

the blade follows a true helix. This is accomplished in the setup, Figure 4, in which the blade is passed between three pairs of rolls. These are disposed at different angles, each pair being driven by its own universal shaft. Each pair of rolls is spaced to fit the faces of the blade but only the second pair is made to grip the blade and this pair is responsible for feeding the piece longidutinally as forming proceeds.

Both outer pairs of rolls are in carriers that can be rocked enough to adjust the angular position of one pair as compared with that of the other pair but, once the correct angle is established, the carriers are locked by nuts on vertical studs supported on the base, as shown in Figure 4. If metal varies in hardness enough to affect spring back, the rolls may have to be readjusted for this change.

To affect the forming, a blade previously given its curved shape in the die, Figure 3, has one end pushed by hand between the first pair of rolls and into the second pair while all rolls are turning. The second pair grips the blade and pushes it into the third set from which the blade issues automatically, shaped as required. Actually, the difference in angular position of the roll gives the blade a twist and, in so doing, makes the blade conform to a helix as desired.

To check the forming, each blade is laid in a gage shown at the left in Figure 4. This gage has a true generated helical surface against which the blade must fit. At the same time, the cutting edge must come flush with the outer edge of the

(Continued on page 98)

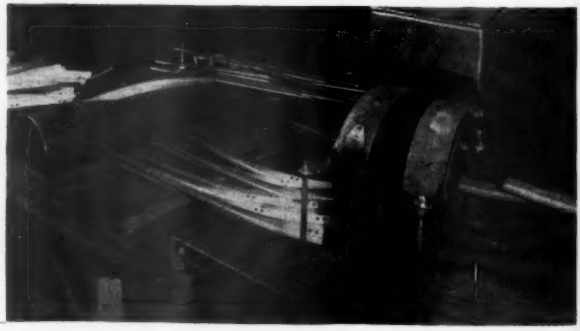


Fig. 4. Special machine having three sets of rolls arranged at different angles so that, when the knife blades formed as in Figure 1 are run through, the blades are given their final helical shape and fit the gage at left.

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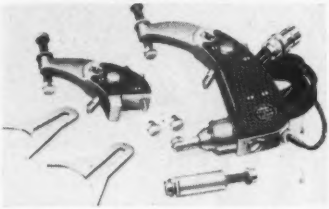
MORTON MACHINE WORKS

. . . Exhibitors, from page 76

Exhibitor **Booth No.**

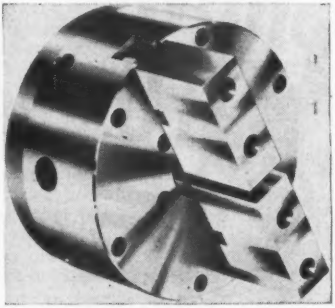
Brown & Sharpe Mfg. Co.
Booth No. 1435



On Display: New electronic caliper gage (illustrated) together with complete lines of small tools, cutters and precision measuring and gaging equipment. Also shown for the first time will be the B&S Intrimik, a new internal tri-point micrometer.

In Attendance: Executives and sales directors from Providence plant, and Chicago office personnel.

Buck Tool Co.
Booth No. 153



On Display: The new Ajust-Tru 2-jaw aviation chuck, especially designed for use on light lathes in chucking odd-shaped parts that offer only irregular holding surfaces.

Cadillac Stamp Co.	853
Campbell Machine Div.	
American Chain & Cable Co., Inc.	1126
The Capewell Mfg. Co.	2027

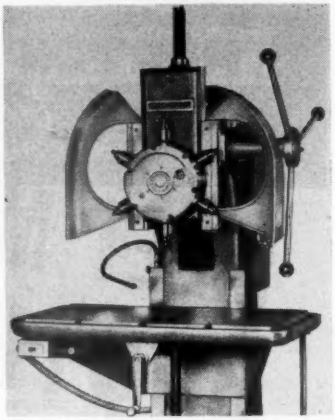
Carboloy Dept. of General Electric Co.
Booth No. 539

On Display: Carbide single point tools and tool blanks, carbide press dies, new Series 600 chrome carbide, carbide bearings, Alnico permanent magnets, Hevimet radiation resistant metal, carbide-tipped drills and trepanning tools.

The Carborundum Co.	1326
W. R. Carnes Co.	137
Chicago Pneumatic Tool Co.	425
Chicago Tool & Engineering Co.	310
Chicago Tramrail Co.	218

Exhibitor **Booth No.**

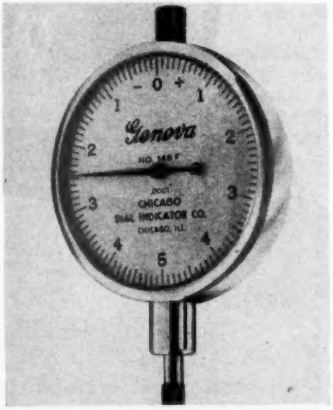
Burg Tool Mfg. Co.
Booth Nos. 1113, 1115



On Display: New No. 2 Model A Burgmaster drilling and tapping machine (illustrated) with Warner Electric Clutch units, new tapping head, floating tool holders.

In Attendance: Fred Burg, Joseph L. Burg, Roderick A. Gorman, Frank Alexander and Frank Haley.

Chicago Dial Indicator Co.
Booth No. 511



On Display: Geneva dial indicators including new Model 145 (illustrated), new magnetic base test sets; new bench dial gage, universal dial test sets, lens measures and depth gages.

In Attendance: Peter Flauter, Peter R. Flauter, Arthur Boruta, Angus F. Turner and Stanley E. Ternstrom.

(Continued on page 100)

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Reo Tooling, from page 94

helical surface, which is a part of a cylinder having a radius slightly larger than that of a finished reel. The cutting edges of blades are not ground until after the blades are riveted to reel spiders and the whole assembly has been heat-treated to harden the blades. During this grinding, the reel shaft is on centers about which the reel is turned as grinding proceeds and gives the reel its final diameter.

Grooving Drive Wheel

Another component of power lawn mowers that involves unusual tooling is the wheel shown in Figure 5. This wheel is made from a 13-gauge blank that has been drawn to depth but has a cylindrical wall whose elements lie nearly or precisely parallel to the axis. The bottom or web is dished and pierced with holes for assembly to mating parts. Drawings call for a part in which the cylindrical portion is formed to provide a shallow groove of large radius.

Such a groove could not be produced in a draw die, of course, because, even if it could be formed, it would result in undercuts so that the workpiece could not be withdrawn. For this reason, the groove is rolled, using the machine shown in Figure 5. Forming is done between a pair of rolls that turn about vertical axes. The inner or male roll has a groove of the required shape but has to be enough smaller than the workpiece to permit its removal after forming is done, since the inner diameter of the piece is reduced as a result of the rolling.

To rotate the inner form, it is bolted to a flange on the top end of a heavy vertical shaft mounted in Timken roller bearings. These bearings are in a sleeve set into the table of the machine. A gear rotates the shaft at slow speed. After the workpiece is placed over the inner form roller, a small roller on a short horizontal shaft supported by a fixed vertical stud is swung around so as to bear on the top face of the workpiece at the opposite end of the diameter from the external pressure roller at left in Figure 5. The small roller keeps the workpiece from cocking when the pressure roller is advanced.

As Figure 5 shows, the pressure roller has a flange that extends over the top of the workpiece when the roller is advanced

Fig. 5. Closeup of the machine employed for rolling a shallow groove in the drawn wheel blanks, one of which is in rolling position over the inner form. Outer forming roll is shown withdrawn. Operator holds a formed piece.

by a ram. Trunnions support the short vertical shaft about which the roller turns on a pair of Timken bearings. To advance the roller, its supporting ram is connected to the outer end of one of a pair of toggle links.

These links are pivoted at their inner ends to a pin in a clevis on the upper end of the ram of a vertical hydraulic cylinder that can rock about a horizontal pivot. When the pressure roll is drawn back, the links slope and make a considerable angle with the horizontal but the angle decreases as the roll is fed in to apply pressure and the links become nearly horizontal when the pressure roll is fed in to maximum depth.

After the workpiece is set over the inner roll, the latter is rotated slowly and the pressure roll is fed in gradually. This causes the workpiece to rotate between the two rolls and forms the groove desired. During forming, the workpiece is eccentric to the inner roll, because the workpiece inner diameter is greater than the diameter of the inner roll. Several revolutions of the workpiece are made before the two rolls assume their final positions. When the groove is completely formed, rotation is stopped, the pressure roll is withdrawn, the small roller that prevents cocking is swung back and the formed wheel is lifted

(Continued on page 106)

THE MOST NEWS
and
THE BEST NEWS

ABOUT SMALL, PRECISION SPUR GEAR HOBBING

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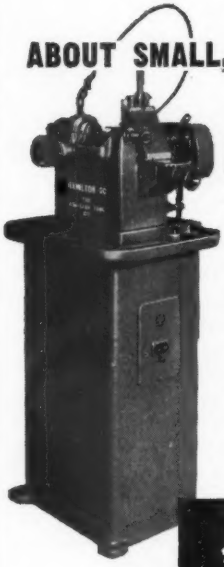

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Whether your work calls for long production runs or frequent set-ups, you need to know about the Hamilton No. 00 Precision Spur Gear Hobber. Spend a minute now to send your request for a copy of our Bulletin No. H-00-49. Acquaint yourself with this efficient tool, and be ready for the challenge ahead.

NOTE: If you are interested in helical gears, worm gears, bevel gears, and crown gears, as well as spur gears, ask for Bulletin H I-49. No obligation.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 96

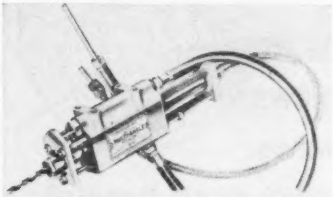
Exhibitor	Booth No.

Chicago Wheel & Mfg. Co.
Booth No. 314

On Display: A new mounting for portable tool wheels and tool cutter wheels; the world's smallest mounted grinding wheel (3/64" dia.) and the world's largest mounted grinding wheel.

Cities Service Oil Co.	346
Circular Tool Co., Inc.	634
Cleco Div.	
Reed Roller Bit Co.	413
Cleveland Tapping Machine Co.	300
Collins Micro-Flat Co.	608
Colonial Broach Co.	1201
Columbia Enterprises, Inc.	341
Columbia Export Co., Inc.	1909

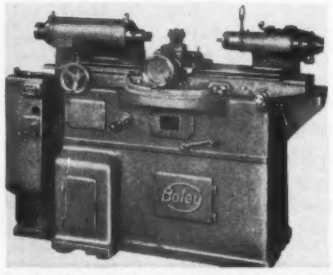
Commander Mfg. Co.
Booth No. 1238



On Display: New MULTI-ANGLE drill unit (illustrated), new drilling coolant table, MULTI-DRILL, tapper, drill chip breaker.
In Attendance: J. B. Chamberlain, Frank O'Laughlin, William E. Wilson, John J. Tully and Warren Hartmann.

Connecticut Tooling Service, Inc.	842

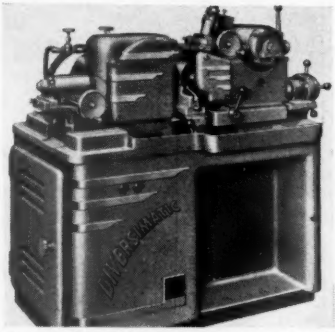
Cosa Corp.
Booth No. 1750



On Display: Boley micro-finish lathe (illustrated), Boley multi-spindle drilling and tapping machine, Blasi abrasive cut-off machine, Bechler "Isomatic" Swiss automatic screw machine, Fortuna internal and face grinder, Pittler turret lathe, Sallaz semi-automatic burnishing machine, Sigma fully-automatic multi-dimensional inspection, sorting and tabulating machine, Wanderer column milling machine, and Kolb gear grinding machines.

Exhibitor	Booth No.
Connors & Davis Sales Corp.	215
Arthur A. Crafts Co., Inc.	741
Crane Packing Co.	1908
Crucible Steel Co. of America.	1401
Crystal Lake Grinders	1138
Dake Engine Co.	1019
Danly Machine Specialties, Inc.	1610
Dayton Rogers Mfg. Co.	1843
Dazor Mfg. Corp.	845
De Castro & Associates	1904
Delpark Corp.	1230
Delta Power Tool Div. Rockwell Mfg. Co.	209
Detrex Corp.	2035
Detroit Power Screwdriver Co.	140
Detroit Stamping Co.	115
Dewalt, Inc.	2005
Eugene Dietzgen Co.	332
Dilley Mfg. Co.	243

Diversified Metal Products Co.
Booth No. 1239



On Display: New Diversimatic centerless grinder.
In Attendance: J. K. Sutherland.

The DoALL Co.	1634
Doerr Electric Corp.	
Electro Machines, Inc.	208
Doughty Labs., Inc.	216
Dow Mechanical Corp.	711

The Dumore Co.
Booth No. 404

On Display: Tool-post grinders, hand-grinders, flexible shaft tools, with emphasis on new automatic drill head and drill grinder for drilling No. 70 to ¼".
In Attendance: Earl Owen, George Zavis, Jim Steibel, Roy Beach, Ray Gruhn, Lee Augustine and G. H. Nehoda.

Durable Punch & Die Co.	214
Durant Mfg. Co.	837
Dynatomic Corp.	840
Eagle Grinding Wheel Co.	840
Eastern Machine Screw Corp.	450
Eastern Sales Co.	1816
Eastern Tool Co.	102
Eastman Kodak Co.	518
Eclipse Counterbore Co.	526
Elastic Stop Nut Corp. of America	217
Electro-Arc Mfg. Co.	100

(Continued on page 104)

Tiny holes? . . . . . Easy!

Accurate holes? . . . . . Easy!

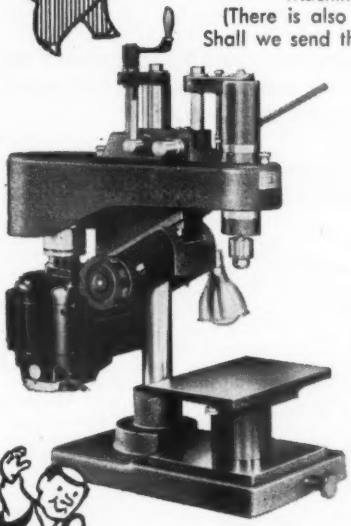
Holes on production schedules? . . . . . Easy!

***Tiny, accurate* holes on *production schedules?* . . . WOW!**

Hamilton Drilling Machines can do it!
And withdraw the drill undamaged
from hole after hole after hole!

LEARN HOW!

Write for the series of Hamilton Drilling
Machine Bulletins and Price Lists.
(There is also a companion Tapping Machine.
Shall we send that bulletin along with the others?)



Shown here is the Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole Drilling Machine, one of four models, each particularly adapted to the work for which intended, all equally precise.

THE *Hamilton* TOOL COMPANY

832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

THE NEW
CLAUSING
HEAVY DUTY
18" DRILL PRESS

A HEAVY DUTY GENERAL PURPOSE DRILL FOR PRODUCTION, TOOL ROOM, MAINTENANCE, AND SERVICE SHOPS

★ Drills to Center of 18¼" Circle ★ Drills ¾" in Steel, 1" in Cast Iron ★ 6½" Spindle Travel ★ 63/64" Spindle, Equipped with No. 3 Morse Taper ★ 39" Maximum Distance Spindle to Table, 50" Spindle to Base ★ 13" x 18" Production Oil Table or 12" x 14" Tilting Table ★ 4 Ball Bearings — 3 Single Race, 1 Double Race.

Outstanding features include: massive construction and precision machining to assure an extra measure of fine performance; drive spindle supported by sealed-for-life ball bearings above and below pulley; sealed-for-life ball bearing at top and double row sealed ball bearing at bottom float spindle free from quill; both races in double row bearing absorb drill thrust; Vernier depth control stop; greater spindle travel for bigger work capacity and better use of quick-release production chucks; positioning mechanism moves *both* head and table; hinged motor support base; precision ground base. Catalog sent on request.

CLAUSING DIVISION

ATLAS PRESS CO., 384 N. PITCHER ST., KALAMAZOO, MICH.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

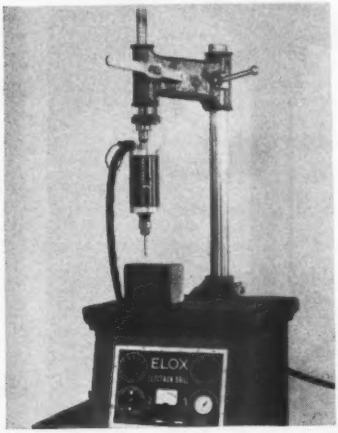
. . . Exhibitors, from page 100

Exhibitor **Booth No.**

The Electro-Mechano Co.
Booth No. 419

On Display: New 16" wide range variable speed drilling machines (illustrated), a line of 8" precision variable speed drilling machines, portable and stationary electric tachometers.

Elox Corp.
Booth No. 318



On Display New Model M-51 Electron Drill (illustrated), plus larger models of this drill and tap removal equipment.

Engineering Mfg. Co.	125
Engineers Specialties Div.	633
Engis Equipment Co.	525
Ercona Corp.	515
Errington Mech. Lab., Inc.	212

Exhibitor **Booth No.**

Abrasives Div.
Elgin National Watch Co.
Booth No. 740

On Display: DYMO Diamond Compound (a cartridge of which is shown inserted in applicator gun) for general purpose finishing, and DYMO-C Diamond Compound for use with carbides.

Enco Mfg. Co.
Booth No. 610

On Display: New "MITI-MITE" No. 250 (illustrated), a portable magnetic base lighting unit; new "MITI-MITE" No. 120, a combination magnetic base holder for magnifiers and dial indicators; new "MITI-MITE" No. 500, a portable demagnetizer; other magnetic base holders, adapters, bulbs; and a complete line of lathe turrets.

Erickson Tools Div.
Booth No. 1127

On Display: Speed indexers, air cylinders, sleeves, collets, collet chucks, expanding mandrels, adjustable holders, Erickson-State boring bars, reamer holders, drill chucks, tap chucks, milling machine chucks and self-releasing tap holders.

In Attendance: Erickson field engineers.

Ettco Tool Co.	1243
Euclid Tool Engr. Co.	545
Federal Machinery Sales Co.	1108
Federal Products Corp.	733
Field Abrasive Specialty Mfg. Co.	312
Foote Bros. Gear & Machine Co.	1109
The Gairing Tool Co.	738
Gammons-Hoaglund Co.	1231
The Garlock Packing Co.	105

(Continued on page 108)

SIX SPINDLE
PRE-SELECTIVE SPINDLE SPEEDS
TURRET TYPE AUTOMATIC INDEXING
DRILLING AND TAPPING MACHINE

. . gives you 6 MACHINES IN ONE

THE NEW No. 2 MODEL A

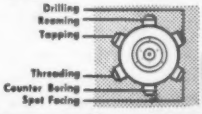
Burgmaster

Designed for . . .
HIGHER PRODUCTION WITH GREATER ACCURACY AT LOWER COST PER PIECE MACHINED

The No. 2 Model A BURGMASTER will definitely cut your second operation costs because: Loss of time due to movements of parts from one spindle to another are eliminated; Close tolerances on size and concentricity are easily maintained; Set-up is simple and fast—unskilled operators can run the machine; Less floor space and power required; Rigidity, power and spindle speeds permit the use of high cutting speeds.

Now equipped with Warner Electric Clutch units in speed change mechanism.

★ ¾" Drill Capacity
★ ½" Tap Capacity
★ 1 to 2 H.P., 2 speed, 3 phase, 60 cycle Motor
★ 12 Spindle Speeds, ranging from 225-3000 R.P.M.
★ 4 Speeds, pre-selective per spindle, at any one setting
★ 8" Ram Feed
★ 19" Table Travel
★ Throat Depth—11-5/16"
★ Spindles Mounted on Class "O" Timken Bearings
★ Power Index, utilizing Geneva Mechanism
★ Individual Depth Stops
★ Completely Enclosed Gear Box
★ Table work surface—17"x33"
★ Approximate weight—1650 lbs.
★ Floor space required—36"x48"
★ Extremely close tolerance can be held



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BURG TOOL MANUFACTURING CO. Dept. T3
3743 DURANGO AVENUE • LOS ANGELES 34, CALIFORNIA

SEE OUR DISPLAY AT THE A.S.T.E. EXPOSITION — BOOTH NO. 1113, 1115

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Reo Tooling, from page 98

off. The production rate is about 341 pieces per hour.

Knife Bar

A part termed a "knife bar" is the part against which the reel, carrying the five cutter knives in a lawn mower reel assembly, revolves to cut grass. These bars are projection welded at each end to a stamping, portions of which can be seen in Figure 6. This illustration shows the welding fixture employed. Bars are made in three lengths, approximately 18, 21 and 25 in., all being handled in the same fixture, which has an adjustable foot or stop that is set to support the lower end of the bar. This brings the upper end into correct position relative to the stamping and to the electrodes.

To insert the bar, it is necessary to mount a gate so that it will rock about a vertical pin when the fixture is opened. When the bar is in place, the stamping to be welded to it is placed with two of its lugs between slots in C-shaped guides of the welding fixture. The gate is closed and locked by a roller on an air operated bellcrank which rides up a cam surface. This gate has three spring loaded pins that bear on one edge of the stamping and position it correctly as the gate is closed and locked.

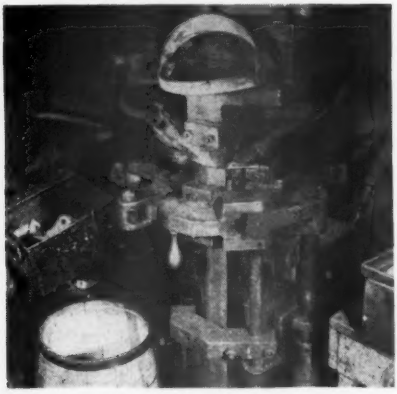


Fig. 6. Setup in which stamped components are welded to knife bars. The fixture is shown in closed position just after one projection weld has been completed.

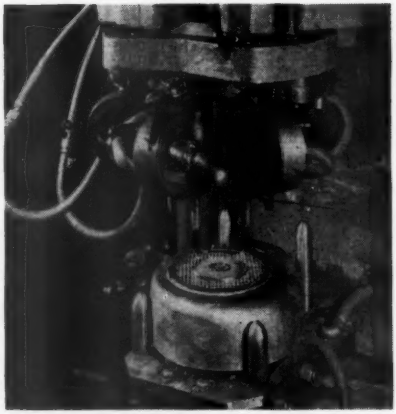


Fig. 7. Setup for welding a hub to a stamping that is part of the assembly shown in place. The tapered hub is pressed into a hole and is welded around the entire circumference.

This brings projections on the stamping into contact with the bar and, when the welder is actuated, the electrodes press the projections against the mating surface of the bar and the corresponding welds are made. Then the bar is removed, shifted end for end, a second stamping is added, clamped and welded to the second end, completing the work in this setup. For safety, a transparent plastic guard, similar to a mask, is pivoted to the head of the 300 Kva Federal welder and is swung down to shield the operator from flying sparks. With this setup, two welds on 54.8 assemblies are produced per hour.

Welded Assembly

In the setup shown in Figure 7, a hub is welded to an eight-gauge stamping in a 150 Kva Taylor-Winfield machine. This hub resembles a bushing that is tapered on its outer diameter and fits into a hole pierced in the stamping. The weld takes place all around the circumference at which the hub contracts the hole but the distance from the face of the hub to the face of the stamping is held within about 0.010 in. of the nominal dimension. About 238 assemblies per hour are made in this setup.

Borg-Warner Products Development Laboratory

Borg-Warner Corporation has announced the establishment of a Products Development Laboratory in Detroit as a separate division entrusted with responsibility for carrying both defense and civilian items from the invention stage to actual production.

The development of new products for war use and the improvement of automatic transmissions are the projects which are being given priority by the staff of more than 50 engineers, designers and other technicians at work under the direction of David T. Sicklesteel, newly appointed general manager of the laboratory. Mr. Sicklesteel previously was vice president in charge of engineering with the Detroit Gear Division of Borg-Warner.

The laboratory, occupying 20,000 square feet of floor space at 8651 East Seven Mile Road, Detroit, has been equipped with electric- and gas-driven dynamometers and other testing devices as well as with highly modern machine shop tools. There also is a special fleet of passenger cars and trucks for the road-testing of transmissions, torque converters, transfer cases and other automotive equipment under development in the laboratory.

"The laboratory is enlisted in the national defense effort in the creation and improvement of military products," Mr. Sicklesteel said. "In addition, we are concentrating on the development of lighter, simpler, more efficient, less expensive automatic transmissions and torque converters for automotive use."

One of the two types of automatic transmissions now being produced by Borg-Warner was developed under Mr. Sicklesteel's direction. In addition to Mr. Sicklesteel, an advisory committee will assist in the direction of the laboratory. Members of the committee are C. S. Davis, chairman of the board of Borg-Warner; Roy C. Ingersoll, president of Borg-Warner; Howard E. Blood, vice president of Borg-Warner; A. J. McAllister, president of the Detroit Gear Division; and E. S. Russey, vice president of the Warner Gear Divison.

Borg-Warner also established a Central Research Laboratory in Bellwood, Ill., early last year to work on research problems of a long-range nature.

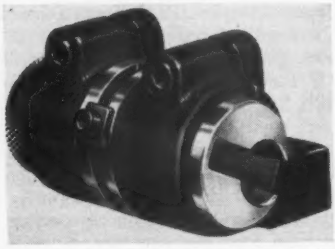
Finer Finishes Faster!
ELGIN DIAMOND
in DYMO Diamond Compound
Pure, virgin diamond in an exclusive field-proved vehicle gives you maximum cutting speed. Certification to Bureau of Standards requirements is your assurance of dependable, predictable results. Write for free demonstration.
ABRASIVES DIVISION
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 104

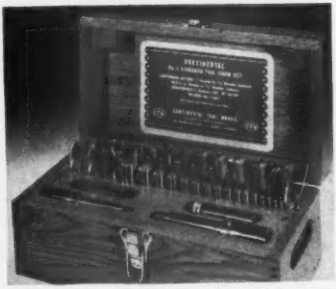
Exhibitor **Booth No.**

EveredE Tool Co.
Booth No. 1012



On Display: Boring bar holders (illustrated) and boring bars for turret lathes, boring bars, boring heads, carbide tool holders with triangular tool bits.
In Attendance: A. J. Proksa, Andrew Graham and Frank B. Ross.

Ex-Cell-O Corp.
Booth No. 1708



On Display: Continental Counterbore Sets (illustrated), standard and special cutting tools and broaches, new jet engine compression blades and fuel nozzles, new pine-tree form broaches for machining slots in jet turbine wheels, carbide-tipped form milling cutters for milling the airfoil form of jet blades, precision grinding spindles, and drill jig bushings.

Firth Sterling Steel & Carbide Corp.
Booth No. 725

On Display: New Method X machine for working sintered carbides and other superalloys, plus high speed steels, tool and die steels, Sterling stainless steels and Globe Wire products, sintered carbides (standard tips and tools), and new Mechanigript and Mechaniclamp tools.
In Attendance: T. W. Gabriel, D. G. Clark, C. R. Harmon, J. S. Roller, D. F. Dickey, M. F. Judkins, M. L. Backstrom, W. J. Loach, E. J. Reitler, K. D. Mann, E. A. Carpenter and T. A. McLean.

Exhibitor **Booth No.**

Fonda Gage Co.
Booth No. 715

On Display: Fonda Lifetime-Carbide Gage Blocks and Fonda Steel Gage Blocks.
In Attendance: D. C. Fonda, R. L. Arndall, Robert A. Manes, Harry R. Berkshire and A. D. Miller.

Garvin Bros., Inc.	429
Geneva Machine & Tool Corp.	736
Gerotor May Corp.	1801
Giddings & Lewis Machine Tool Co.	1705
L. H. Gilmer Co.	
Div. of U. S. Rubber Co.	236
Globe Heat-Seal, Inc.	1809
Govro-Nelson Co.	119
Graham Machine Tool Co.	1911

Graymills Corp.
Booth No. 224

On Display: Coolant pumps, portable pumping units, Stocklubes and parts cleaning equipment.
In Attendance: R. Hollis, E. Scheibe, O. E. Marthinson, R. McCollom, Bert Darrah, W. Tobey, Fred Cox, J. O'Connor, H. Hartley, W. J. Brown, Fred Littlejohn, B. Sears, William Harper, C. Haley, C. Peterson, W. Peterson, E. Roels and E. Smith.

Green Instrument Co., Inc.	805
F. T. Griswold Mfg. Co.	832

Grobet File Co. of America, Inc.
Booth No. 742

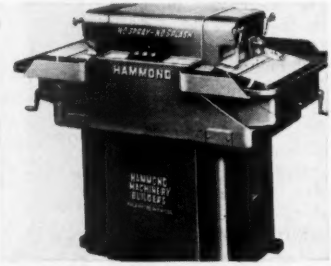
On Display: Rotary files, burrs, Swiss files, rifflers, countersinks and special precision files for various materials.

Gulf Oil Co.	647

Guthery Machine Tool Corp.
Booth No. 1827

On Display: Traub automatics; Leinen precision hand screw machines, turret lathes and precision lathes; Weisser high-speed production lathes and engine lathes.

Hammond Machinery Builders, Inc.
Booth No. 1628



On Display: Model 14-WD carbide tool grinder (illustrated), plus other carbide tool grinders, the No-Dust grinder, variable speed polishing lathe and several different types of Hammond Duskolectors.

(Continued on page 122)

2 NEW "MITI-MITE" TOOLS

Be Sure to See Them at the A. S. T. E. SHOW

AN INVALUABLE MAGNETIC BASE LIGHTING UNIT THAT HOLDS 100 WATT BULB TO CURVED OR FLAT SURFACES INSTANTLY!

MITI-MITE NO. 250

Aluminum socket, rayon-flocked light shield resists heat. Holds up to 100 watt standard bulb.

This amazingly useful "MITI-MITE" unit solves lighting problems heretofore regarded as impossible. Eliminates cumbersome, haphazard clamping. Provides perfect illumination for practically all machines and operations.

6 Ft. 18-2 oil resistant cord comes with each set.

Fingertip lever releases magnet for removal or repositioning. Magnetic pull — 100 lbs. Base size 1¼"x4"

Ball and socket bracket assembly permits precision adjustment.

Full 100 watt light thrown on curved or flat surface during milling operation. No clamp needed.

PRICE $18.50 Complete

NEW, PORTABLE "MITI-MITE" DE-MAGNETIZER— The Foolproof Device Industry Has Been Waiting for

MITI-MITE NO. 500

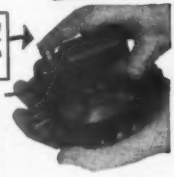
Single pole momentary action switch, normally open.

Base of non-breakable molded plastic 1¼" x 4"

6 ft. oil resistant cord.

Indispensable device wherever magnetism is a problem. Completely de-magnetizes tools, parts, pieces, etc. by merely sliding over surface of item. Every shop needs this truly important device.

Operates by pressing switch with finger. Releasing pressure shuts off unit.



Socket for plugging into any 110 AC outlet.

No. 100	Magnetic base Holder for smaller test indicators.	$7.50
No. 120	Combination Test Indicator magnetic base holder and double lens 4X Magnifier.	12.00
No. 150	Duplex Magnetic Base Holder for all dial indicators up to 3" dia.	$15.50
No. 200	Magnetic Base Handi-Lite complete with 25 and 40 watt bulbs.	$8.50

OTHER "MITI-MITE" UNITS

Also Manufacturers of Enco Lathe Turrets

PRICE $10.50 Complete

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4524 W. Fullerton Ave., CHICAGO 39, ILL.

Order from your mill supply dealer or send order with name of your mill supply dealer

SEND FOR BULLETIN 604

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Carbide Tooling, from page 87

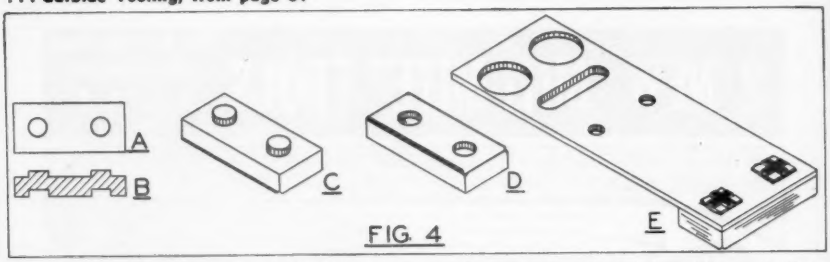


Fig. 4. The vibrator counterweight shown is the result of component redesign. The projections indicated at "C" serve as rivets for attaching the weight to the reed as at "E". The cross-section view at "B" shows how the metal is displaced to almost shearing point. This construction replaces the punching of rivet holes and using small rivets in assembling the weight to the reed.

cates the beveling of the weight which is accomplished by the construction of the punch. This beveling is a small detail but it is an important feature of Radiart vibrators, since it assures uniform magnetic attraction in all positions of the reed and counterweight. Thus the vibrators are quicker starting and smoother operating.

Figure 4-E shows the counterweight riveted to the reed. The design of the riveting punch gives a definite pattern to the rivet head which assumes more or less an embossed cross and spreads the metal sufficiently to insure permanent holding qualities.

Vibrator Frame

Another example of component redesign is found in the vibrator frame. The original design, Figure 5, was called the "L" frame, named thus because of its shape. The short leg of this frame was slotted after the forming operation in order to allow the coil core to project through and for the subsequent staking operation. Because the core must be parallel and square with the long leg of the frame, the accuracy of the assembly was difficult to hold.

In redesigning the part, the frame became known as the "J" frame because of its shape. The part, as shown in Figure 6-A, is stamped in one operation in a pro-

(Continued on page 114)

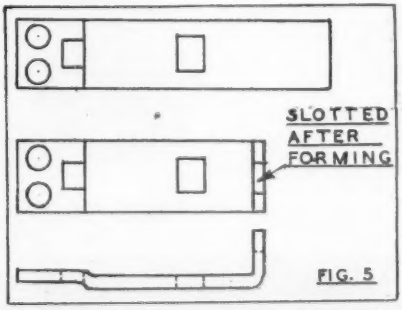


Fig. 5. "L" type vibrator frame used before this component was redesigned. The slot allowed the coil core to project through for the staking operation. Because the core must be parallel and square with the long leg of the frame, the accuracy of assembly was difficult to hold.

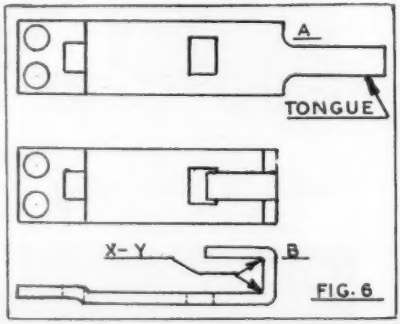
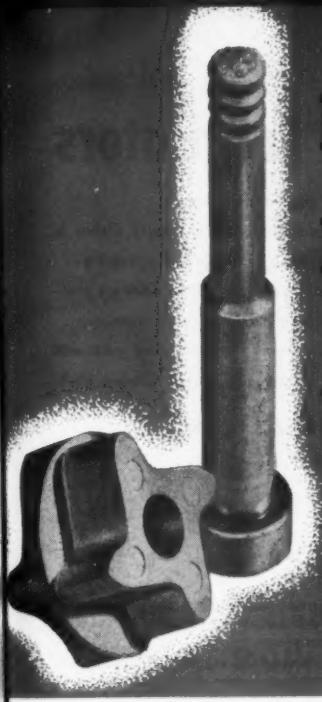


Fig. 6. "J" type vibrator frame. The tongue serves as the core for the coil and must be square at points x-y, parallel with the frame and exactly centered.



Life of This Tool Increased 17 TIMES After Treatment with HARD'N'TUFF

The die cast zinc rotor shown (left) is subjected to a burnishing operation which removes .02 inches of stock. The tool used (right) normally produced from high speed and hard chrome steels was able to finish only 20,000 to 30,000 pieces before refinjshing.

Because of alloy steel shortages and in an attempt to bring about an efficient increase in production the tool was cut from cold rolled steel and treated with HARD'N'TUFF. The user says: "It finally wore out after 500,000 pieces. It held its size all the time it was in use. Previous tools of high speed and hard chrome plate steel lasted approximately 20,000 or 30,000 pieces. What better reccmmendation could I give your material?"

Our Guarantee

TOOL LIFE INCREASED 300%

or

PURCHASE PRICE REFUNDED

Here is real proof that HARD'N'TUFF, the steel hardening compound that provides fast effective three-way action;—carburizing, nitriding, chromizing—can solve many part hardening problems.

The metallurgical effect of the action of HARD'N'TUFF provides structural and chemical changes which raise the Quality properties of the low carbon mild steels.

Easy to use—heat the part, dip and roll in the compound; HARD'N'TUFF is non-toxic and can be used on all types of tools, drills, dies, cams, bits—wherever maximum toughness and wear resistance are required. Write for our folder

"How to Use HARD'N'TUFF."

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The Inside Story of WALES Fabricators

Quick change punches and dies in *7 seconds* . . . a complete set of 36 graduated punches (from 3/32" to 1-1/14") and corresponding dies for various thicknesses of material . . . adjustable finger stops with built-in scale for quick gaging of the work . . . *no templates required* . . . and the simplicity of Wales Fabricator design makes possible startling "never-heard-of-before" time study figures.

Wales Exclusive Hydra-New-Matic Drive is unique in its simplicity of design and operation . . . so unique, in fact, that vibration and noise are practically eliminated at 165 strokes per minute.

Write *today* for packet of time studied parts and fully-illustrated, functionally-colored Catalog 10-A.

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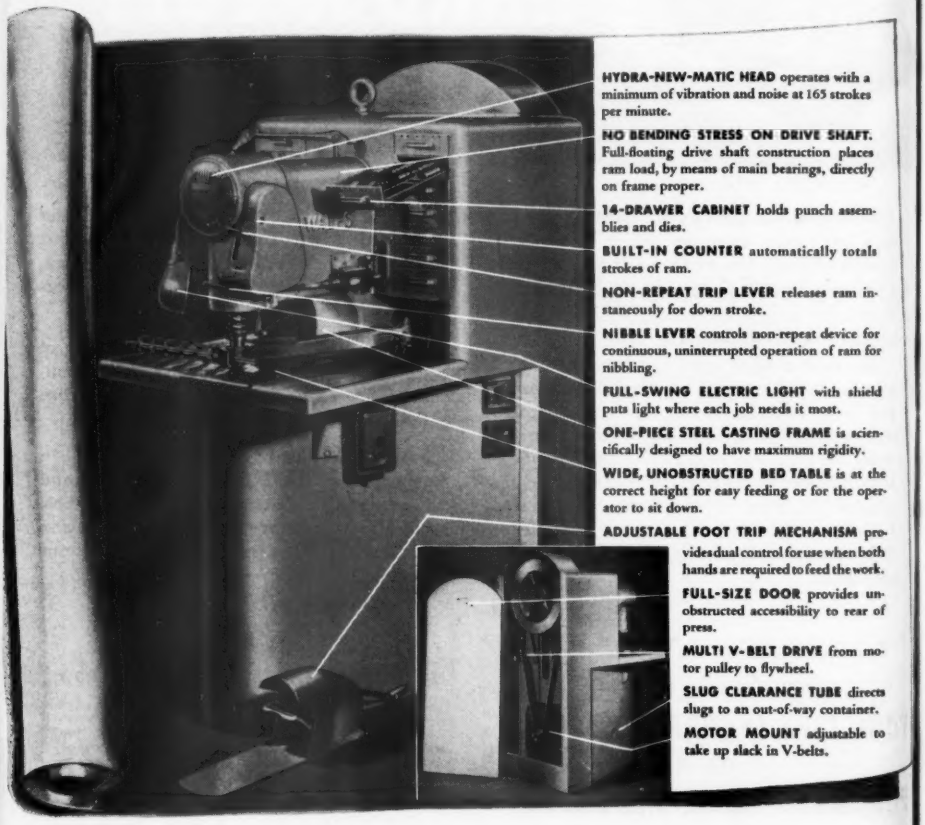
355 PAYNE AVE., NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment



HYDRA-NEW-MATIC HEAD operates with a minimum of vibration and noise at 165 strokes per minute.

NO BENDING STRESS ON DRIVE SHAFT. Full-floating drive shaft construction places ram load, by means of main bearings, directly on frame proper.

14-DRAWER CABINET holds punch assemblies and dies.

BUILT-IN COUNTER automatically totals strokes of ram.

NON-REPEAT TRIP LEVER releases ram instaneously for down stroke.

NIBBLE LEVER controls non-repeat device for continuous, uninterrupted operation of ram for nibbling.

FULL-SWING ELECTRIC LIGHT with shield puts light where each job needs it most.

ONE-PIECE STEEL CASTING FRAME is scientifically designed to have maximum rigidity.

WIDE, UNOBSTRUCTED BED TABLE is at the correct height for easy feeding or for the operator to sit down.

ADJUSTABLE FOOT TRIP MECHANISM provides dual control for use when both hands are required to feed the work.

FULL-SIZE DOOR provides unobstructed accessibility to rear of press.

MULTI V-BELT DRIVE from motor pulley to flywheel.

SLUG CLEARANCE TUBE directs slugs to an out-of-way container.

MOTOR MOUNT adjustable to take up slack in V-belts.

BIG MACHINE PERFORMANCE at Small Machine Cost

Introducing

The NEW Columbia No. 2 Vertical Milling Machine

The success of the Columbia #1 Milling Machine has encouraged its producers to introduce a new, more versatile mill. The NEW #2 incorporates all the advantages of the #1 plus many NEW features.

For full details, write for NEW 4 page illustrated Catalog.

Columbia's #2 Vertical Mill helps relieve bottlenecks—cuts shop costs and increases production.

COLUMBIA ENTERPRISES CORP.

Grays Lake, Illinois

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Carbide Tooling, from page 110

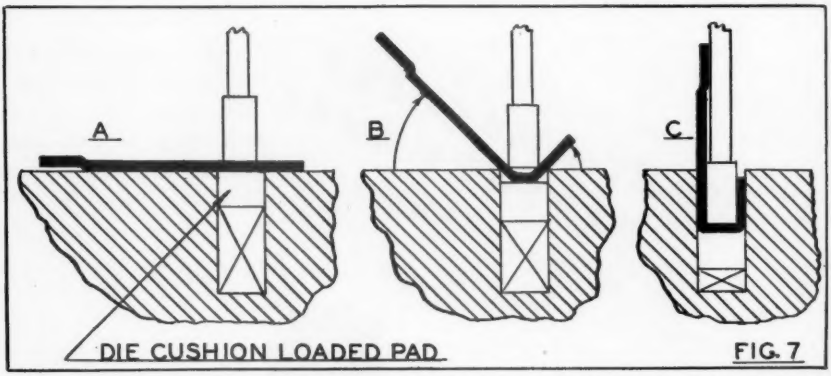


Fig. 7. Forming the frame into the "J" shape and holding it to specifications required that the punch and die be constructed so that no shifting of the work takes place during the press stroke. "A" indicates the start of the stroke, "B", descent of the punch causing the leg and tongue to swing up, and "C", the bottom of the press stroke.

gressive die. In a second operation the J-tongue of the frame is formed as shown in Figure 6-B.

The tongue serves as the core for the vibrator coil and, since it must be square at points x-y, parallel with the frame and exactly centered, the forming die and punch have to be constructed so that no shifting of the work takes place during the press stroke.

Figure 7-A shows the start of the forming operation with the punch just making contact. Figure 7-B shows the punch descending and the leg and tongue sweeping up toward the sides of the punch. At the bottom of the ram stroke, Figure 7-C, the punch has completed the forming. Since parallelism between the tongue and frame leg must be held to a .005" tolerance, any spring-back which might take place after the part is removed from the die is corrected in a simple third operation.

★ ★ ★

Lubrication Engineers Meet Next Month in Cleveland

Thirty-three papers by experts in the technical and semi-technical phases of scientific lubrication and their practical applications are programmed for the 1952 Annual Meeting of the American Society of Lubrication Engineers. Four question-and-answer symposia will augment the three-day gathering, scheduled for the Statler Hotel, Cleveland, April 7, 8 and 9.

Included in the program are the following:

"Forum on Lubrication Economics," "Symposium on Bearing Fatigue," Hydraulic Forum-Progress Report JIC (Joint Industry Conference) Hydraulic Standards," "Symposium on Paper Machinery Lubrication."

Among the papers to be read are:

"Steel Mill Lubrication from Management's Point of View," "What Lubrication of Coal Mining Machinery Means to Management."

"New Horizons in Research," "A New Plan to Aid Independent Inventors," "Lubrication Education," "Lubricant Research in the Department of Defense."

"Turbo-Jet and Turbo-Prop Lubrication," "Physical and Chemical Properties of Aircraft Lubricating Oils As a Guide to Performance," "Oil Fog Lubrication."

"Cutting Fluids for Machine Tools," "The Disposal of Waste Oils," "Prevention and Control of Industrial Wastes."

"Fundamental Knowledge of Lubricating Grease Structure," "Design Considerations for Optimum Performance of Silicone Greases in Baall Bearings," "Dispensing Characteristics of Lubricating Greases."

"Studies of the Mechanism of Surface Damage by Fretting," "Carbide Steel Milling with Cuting Fluids," "The Lubrication Properties of Molybdenum Disulfide."

"Lubricant and Cutting Oil Testing," "Selection and Application of Lubricants."

THIS Verson AUTOMATIC TOOL-UP

speeds production of large caliber projectiles

IN a tool-up developed by Verson and consisting of Verson presses and tooling, 90, 105 and 120 mm. projectiles are produced automatically from billet to finished forging. Production is increased 25% over previous methods; skilled manpower requirements are reduced substantially; material consumption is cut 15% resulting in big reductions in machining time. We will be pleased to send you additional information on this projectile tool-up or to discuss your needs with you. Write or phone.

See a pictorial display of this projectile tool-up at the Verson booth at the Tool Show in Chicago, March 17-21.

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DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Chicago Programs, from page 90

3:30 P.M. **PANEL DISCUSSION: "FINISH GRINDING"**
Moderator: **M. L. Bengtson,** Vice President, Mercury Engineering Company.
R. M. Bell, Technical Mgr., Hammond Machinery Builders, Inc.; **R. A. Cole,** Vice-President, Production Machine Co.; **Adam Gabriel,** President, Acme Industrial Co.; **J. A. Harrington,** Chief Engr., The DoALL Co.; **G. M. Lamabe,** Master Mechanic, Chevrolet-Toledo Div. of G. M. C.; **G. T. Rideout,** Sales Engr., Norton Company.

EVENING

8:00 P.M. **Conrad Hilton Hotel**
20th Annual Banquet, American Society of Tool Engineers
Speaker: **CHARLES E. WILSON, DIRECTOR OF DEFENSE MOBILIZATION**

Friday, March 21st — MACHINE ACCESSORIES, DRIVES & CONTROLS DAY

MORNING (Stockyards Inn)

9:00 A.M. Chairman: **R. E. Beebe,** General Manager, Winkelmann Company.
"ANALYSIS OF COST ESTIMATING PRINCIPLES AND PRACTICES," by **L. E. Doyle,** Associate Professor of Mechanical Engineering, University of Illinois.

9:00 A.M. Chairman: **G. M. Waller,** Chief Engineer, Burgess-Norton Manufacturing Company.
"POWER CHUCKING," by **H. L. Stewart,** Asst. Sls. Mgr., Logansport Machine Co.
"PRACTICAL ASPECTS OF TOOL AND DIE HEAT TREATMENT," by **E. J. Pavesic,** Research Director, Lindberg Steel Treating Company.

AFTERNOON (Stockyards Inn)

1:30 P.M. Chairman: **J. C. Yoder,** Foreman, Martin Machine Company, Inc.
"ELECTRONICS IN MOTOR DRIVES," by **E. H. Vedder,** Manager, Industrial Electronics Control Engineering, Westinghouse Electric Corporation.

2:05 P.M. Chairman: **B. J. Phillips,** Owner, Phillips Auto Parts.
"THE ENGINEER CHOOSES PNEUMATIC OR HYDRAULIC DRIVES," by **J. C. Hanna,** Vice President and Chief Engineer, Hanna Engineering Works.

2:50 P.M. Chairman: **H. J. Braun,** Sales Engineer, Foote Brothers Gear & Machine Company
"MECHANICAL VARIABLE SPEEED DRIVES," by **H. G. Keller,** Assistant Chief Engineer, Link-Belt Company.

3:30 P.M. **PANEL DISCUSSION: "MACHINE DRIVES AND CONTROLS"**
Moderator: **R. O. Knudson,** Special Machine Tool Dept., Greenlee Bros. & Co.
K. H. Casson, Chief Engr., Barnes Drill Co.; **D. B. Enyeart,** Design Engr., The Monarch Machine Tool Co.; **O. J. Maha,** Vice Pres. & Chief Engr., Hannifin Corp.; **R. W. Pashby,** Asst. to Vice Pres., Chg. of Engrg. & Research, Micro Switch Div.; **B. J. Nelson,** Chief Engr., Foote Bros. Gear & Machine Corp.; **R. J. Owen,** Chief Application Engr., The Louis Allis Company.

PLANT TOURS

Monday, March 17, 1952
(9:00 A.M. from Conrad Hilton Hotel)
International Harvester Company, (Mfg. Research Div.)
Lindberg Steel Treating Company
Scully-Jones and Company
Verson Allsteel Press Company

Tuesday, March 18, 1952
(9:00 A.M. from Conrad Hilton Hotel)
Aircraft Engine Division, Ford Motor Company
Clearing Machine Corporation
Electromotive Division, General Motors Corporation
Kropp Forge Company
Lindberg Steel Treating Company
Motorola, Incorporated
Scully-Jones and Company

Wednesday, March 19, 1952
(9:00 A.M. from Conrad Hilton Hotel)
Aircraft Engine Division, Ford Motor Company
Clearing Machine Corporation
Electromotive Division, General Motors Corporation
International Harvester Company, (Melrose Park Plant)
Kropp Forge Company
Scully-Jones and Company
Thor Corporation
United States Steel Corporation
Western Electric Company

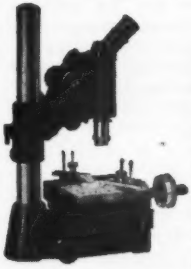
Thursday, March 20, 1952
(9:00 A.M. from Conrad Hilton Hotel)
Clearing Machine Corporation
International Harvester Company, (Mfg. Research Div.)
International Harvester Company (Melrose Park Plant)
Kropp Forge Company
Lindberg Steel Treating Company

(Continued on page 224)

FOUR OPTICAL AIDS to help you SAVE MATERIAL and MAN-HOURS!

1 CONTOUR MEASURING PROJECTOR

Save time and money—*more accurate measurements than with any other projector!* Angular measurements to ±1 minute of arc, with protractor screen. Direct linear measurements to ±.0001" over 4" x 6" range, with cross slide stage. Spot inaccuracies quickly and simply. Compare production-run parts directly with a *traced outline* of the projected image of the master part, or with a large scale drawing superimposed on the screen. *Catalog* D-27.



2 TOOLMAKERS' MICROSCOPE

Linear measurements to ±.0001"; angular measurements to ±1 minute of arc, with protractor eyepiece. Simple, quick measurement of opaque and transparent objects of any contour. *Catalog* D-22.

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4 *New* PARA-PLANE GAGES

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WRITE for full information on these four important optical aids, to help you save time and money. You may be paying many times over their cost in lost time and rejects. Bausch & Lomb Optical Co., 798-15 St. Paul Street, Rochester 2, N. Y.

Bausch & Lomb *Quality Control* Instruments

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

New Indexing Table Offers High Speed Indexing

A new mechanical indexing table, known as the Hautau-Turndex, is designed to move heavy loads from station to station within 3/5 of a second indexing time.

According to Turner Bros., Inc., the manufacturer of this indexing table, the design is based upon an entirely new pattern of movement, every cycle of which is controlled by the uniform gear tooth area of a master sector gear. The intrinsic accuracy of gears, represented by this master sector gear, establishes the basic and unvarying accuracy of the table.

The significant feature of the table is the set of cams which control the master sector gear. These cams are designed to directly govern the acceleration and deceleration of the table in order to completely eliminate abrupt starting, stopping or catapulting action. Maximum production speeds are thus easily maintained. If it were not for the normal safety precautions in the interests of machine operators, it would be possible, without harming the indexing table, to operate the unit at speeds of as much as 1/5 of a second indexing time.

During each cycle of movement, the precise moment of starting and the precise moment of stopping would normally constitute the periods at which shock would occur. However, these crucial start and stop periods are smooth and completely shock-free, regardless of extremely high speeds such as those indicated.

Only one horsepower is required to operate a 24-inch unit with an 800-pound work load on the table top.

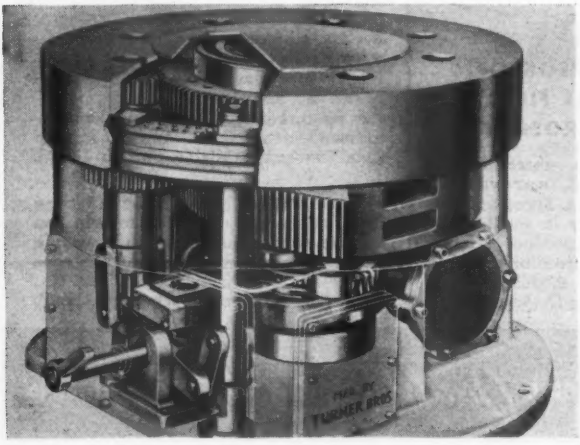
Standard units are available in from two to 26 stations, in any equal division of 360 degrees, but the table may be adapted to a larger number of stations if desired, or applied as a driving unit for indexing larger rotary tables up to 12 feet in diameter.

The table is being adapted for milling, drilling, reaming, boring, counterboring, crimping, stamping, assembling, etc. It has been successfully adapted to mechanical handling operations on complex assembly line procedures for the purpose of rotating parts to various degrees for machining, and for simple positioning.

Standard Hautau-Turndex units offer two optional table-top designs:

a. A table top which revolves, in its entirety, as a single unit.

b. A table top which is divided into two sections, consisting of a revolving outside indexing section, and a *stationary* center section. A machining unit may be mounted to the stationary center section for machining the work outward from the inside. This feature does away with the necessity of massive, overhanging fixtures and columns.



The ability of this new indexing table to move heavy loads from station to station within 3/5 second indexing time is based upon an entirely new pattern of movement, every cycle of which is controlled by the uniform tooth area of a master sector gear.
Two table tops are available, a top which revolves in its entirety as a single unit, and a top which is divided so that its outside section revolves and the center section remains stationary. The design of this top permits the machining of a part from all sides at the same time.

Photo courtesy
Turner Bros. Co.

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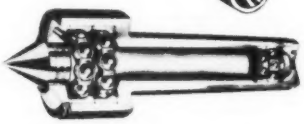
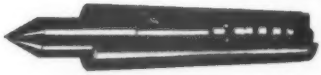
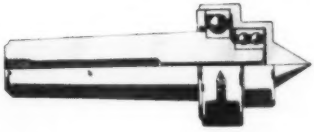
IDEAL (with exclusive interchangeable inserts) **LIVE CENTERS**



"NIROL" TRADE MARK



Needle Bearing Spring Loading LIVE CENTERS



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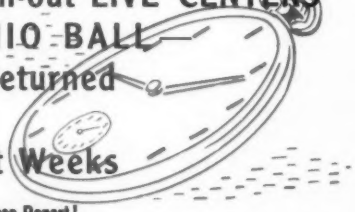

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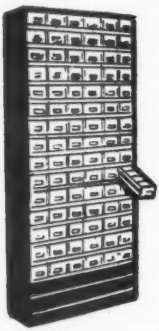
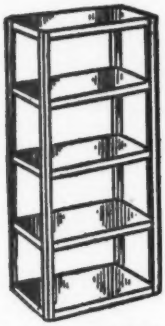


12" deep, 36" wide, approx. 84" high. Assembled. F.O.B. Cleveland: $143.75



18 ga. stock. 4 posts, 5 shelves. Shipped knocked down. 84" H, 36" W, 12" D: $15.95. 18" x 36" x 84": $18.95. 24" x 36" x 84": $21.95

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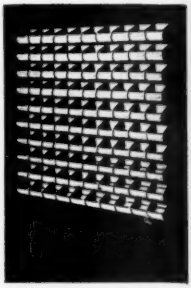

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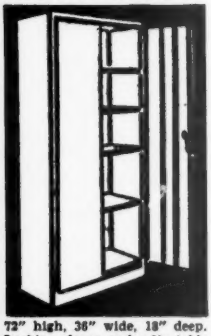

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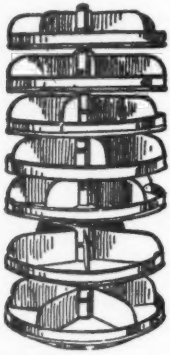

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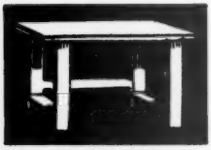

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20"x28"x34". Complete with drawer: $22.50. Same as above without drawer: $14.25.

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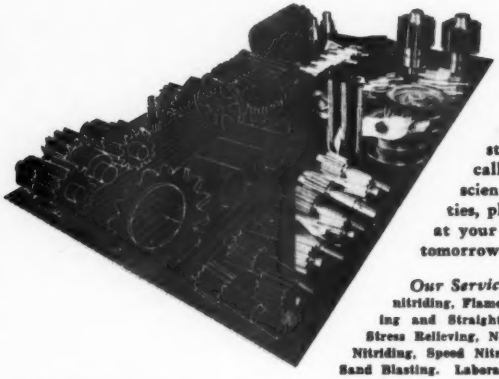

The steel being processed in our plant today will become tomorrow's finished products. To satisfy the great diversity of steel treating specifications by industry, we must be ready! Lakeside's experience in steel treating covers over forty years of depression, peace war and "cold war". We have equipped ourselves to handle your steel swiftly, efficiently and economically in all the accepted processes of scientific steel treating. Our large facilities, plus the skills of our metallurgists are at your command. Use them today for *your* tomorrow!

Our Services: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting. Laboratory Research, Tensile and Bend Tests.

THE *Lakeside Steel Improvement Co.*

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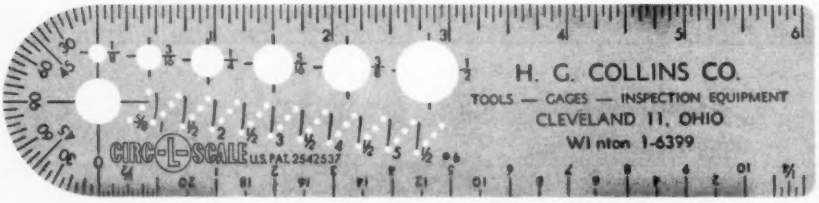

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The Tumico King-Way Alignment Instrument assures precision alignment of all types of new, old or rebuilt lathes, milling machines, grinders, shapers, gear cutting machines, radial drills, etc. It quickly indicates misalignment and the corrective measures needed.

The Tumico King-Way Alignment Instrument saves time, money and materials. It locates machine inaccuracies *before* they cause production rejects. It makes new machine set-up and accurate old machine rebuilding easy. The Tumico King-Way Alignment Instrument is economically priced.

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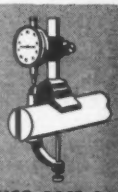
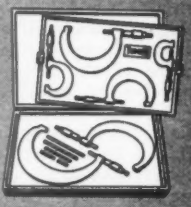
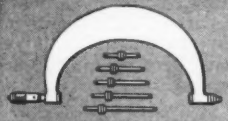


TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.



TUMICO OVER-THE-BAR MICROMETERS
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TUMICO VERNIER CALIPERS
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TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Current Developments in Titanium

Production of titanium metal is getting into the long-pants stage. To meet vital military requirements, it is being developed at a much faster rate than usual for a newly produced metal.

The world's first small-scale commercial production of ductile titanium metal was started by the Du Pont Company in 1948. This was in a small unit at the Newport, Del., plant of the Pigments Department. Rated capacity was 100 pounds a day, but its production did well to run half that much. Now a new plant has been built at the same location which turns out regularly greater-than-ton lots of the metal. Production now is at the rate of 1½ tons per day and is expected to get up to 2½ tons per day in 1952.

The substantial production increase in such a short time results from continuing research on quality improvement and manufacturing process. Du Pont is currently spending about $1,000,000 a year for research on the metal and ways to make it.

Normally the growth would not have been this rapid because it has not been possible to develop a low-cost conventional smelting process for making it. However, because of the government's urgent demands for the metal for defense purposes, the company scaled up production on the basis of the improvements it had been able to make up to that time. The research program has been speeded up for the same reason.

Strides have been made in the production and smelting of titanium, which were in an elementary stage three years ago. However, research to date has not been able to develop the much-sought continuous production process which would provide the key to mass production of low-priced metal. Du Pont is continuing extensive research in that direction.

Although the ultimate goal has not been reached, Du Pont's progress has been substantial. One major achievement was to learn how to make quantities of the metal of good quality and to do it regularly. Another was to develop and build the massive equipment which turns it out in lots of more than a ton at a time—a tremendous quantity considering that the metal was little more than a laboratory curiosity when Du Pont started research on it.

Broad improvements have been made in the manufacturing process itself, although details can not be disclosed at this time. It still involves a reaction of titanium tetrachloride with magnesium, but differs from that originally used when production was first started.

From the basic work of Wilhelm Kroll, the U. S. Bureau of Mines pioneered and developed the process through the laboratory to the pilot unit stage. This point was reached in the late years of World War II. Du Pont started research on the metal on a sizeable basis in 1942 and its work ran roughly parallel to that of the Bureau. The company pioneered commercial production of titanium, bringing in the first small unit in 1948. Du Pont research and engineering advances have since transformed the process into a vastly different and larger scale operation.

With these advances in technology and plant capacity, Du Pont finds that production has moved out ahead of the development of uses for the metal; that consumption has not kept pace—probably a temporary situation. As the defense program moves ahead, the demand is expected to go up substantially and require greater capacity. Plans for this are being contemplated now, but there is nothing definite.

Thus far in the development of the metal, Du Pont has been the chief producer. It was the sole commercial producer in 1948, when its total output was about 5,000 pounds. The Bureau of Mines was producing metal for research purposes only, at that time.

Du Pont's output grew to 55 tons in 1950, the major part of the nation's total put at 75 tons by the Bureau. This year, Du Pont's capacity went up to 600 tons a year with the new equipment. Actual production for the company is estimated at about 400 tons for 1951, out of a total of 700 tons for the nation, as estimated by the Bureau.

This growth by Du Pont was made in four stages. First was the 100-pound unit.

(Continued on page 162)

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PRECISION HEAT TREATING OF AIRCRAFT PARTS

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 108

Exhibitor	Booth No.
H. E. B. Machine Tools, Inc.	1800
H & H Research Co.	128

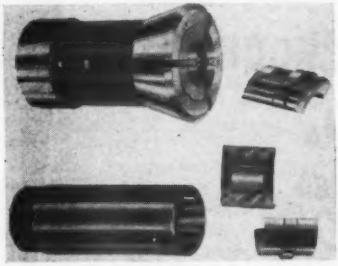
Hanchett Magna-Lock Corp.
Booth No. 645

On Display: The new magnetic sine chuck, plus other magnetic chucks, the Magna-Vise, magnetic coolant separator and magnetic chuck accessory equipment.

In Attendance: J. F. Manting, D. D. Stone, C. W. Adkins and F. W. Knopf.

Handy & Harman	1818
Hanna Engineering Works	1625
Hannifin Corp.	1609
Hansford Mfg. Corp.	150
Hanson-Whitney Co.	829

Hardinge Brothers, Inc.
Booth No. 1516



On Display: Style "S" Sure-Grip master collets and Style "B" master feed fingers (illustrated top and bottom, respectively), other screw machine collets and feed fingers, collet index fixtures, speed collet chucks, Model HLV tool room and production lathe.

R. G. Haskins Co.	333
Haynes Stellite Div. Union Carbide & Carbon Corp.	1122
Heintz Mfg. Co.	424
Heli-Coil Corp.	316
Henry & Wright	1325
Hercules Presses, Ltd.	1031
The Herman Stone Co.	814
Heston & Anderson Div. of St. Paul Foundry and Mfg. Co.	430
Alfred Hofmann Needle Works, Inc.	1715
Honan-Crane Corp.	1716
Hydroway Scales, Inc.	108

Ideal Industries, Inc.
Booth No. 642

On Display: Live lathe centers, Thermo-Grip soldering equipment, electric etchers, demagnetizers, tachometers and wire strippers.

In Attendance: M. A. Buettell, Gordon B. Koch, R. H. Anderson, P. J. Norman, V. G. Mulligan, R. L. Jackson, W. A. Tucker, C. D. Jennings, L. E. Peterson, F. C. Binkley, E. L. Jones, K. W. Zartler, W. F. Veech and J. M. Elliott.

Exhibitor	Booth No.
Illinois Tool Works	1223

Index Machine Co.
Booth No. 148

On Display: Model 40 improved vertical mill, Model 55 vertical mill, Model 60 Horizontal mill, rotary tables, and various accessories and attachments.

In Attendance: H. T. Andress, G. S. Adams, A. Marsh and R. L. Eberenz.

Industrial Tectonics, Inc.
Booth No. 315

On Display: Precision special alloy balls made out of tungsten carbide, HSS, synthetic sapphire, etc.

In Attendance: H. F. Stern, E. H. Cress, J. C. Hooper, K. W. McKenzie and R. W. Niles.

Ingersoll-Rand Co.	1639
International Harvester Co. Mfg. Research Dept.	615
J & S Tool Co., Inc.	1922
Janney Cylinder Co.	324
The Charles L. Jarvis Co.	1534
J. G. Jergens Co.	743
Jergens Tool Specialty Co.	350
C. E. Johansson Gage Co.	701
Johansson & Windle Co.	1840
Eric S. Johnson Co.	111
Johnson Gage Co.	817

S. C. Johnson & Son, Inc.
Booth No. 104

On Display: Wax lubricants for metal-working.

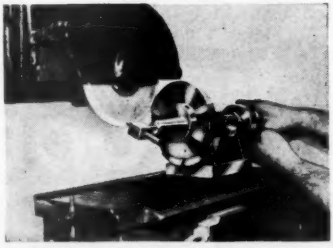
In Attendance: J. B. Carse, G. E. Petersen, George Boehm, R. F. Farley and R. H. Deihl.

Jones & Lamson Machine Co.
Booth Nos. 1411, 1417, 1425

On Display: New applications and seven different models of optical comparators, plus all J&L tangent and radial die heads.

Kalamazoo Tank & Silo Co. Machine Tool Div.	1023
Kaufman Mfg. Co.	1926

Last Word Sales Co.
Booth No. 438

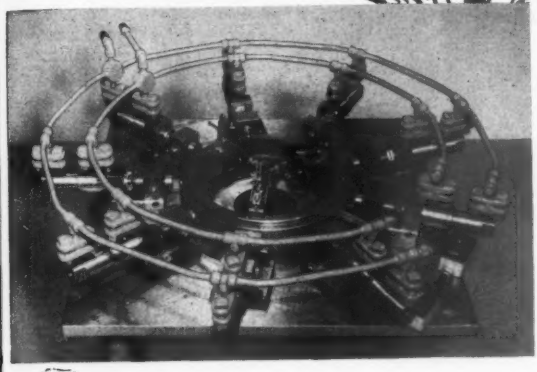


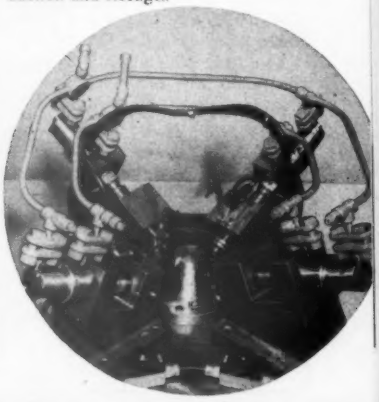
On Display: Last Word wheel dresser (illustrated) and Samson offset boring chuck.

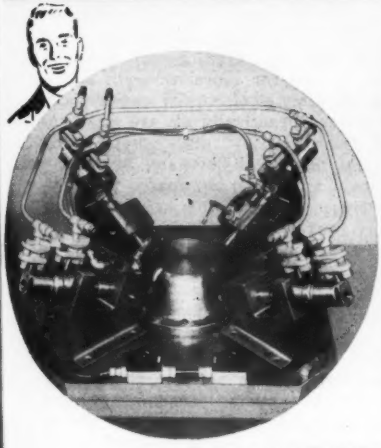
(Continued on page 126)

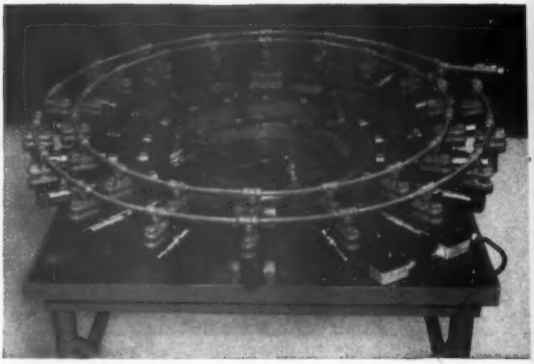
Industry looks to Barth for RADIAL HYDRAULIC PIERCING UNITS!

NO PUNCH PRESSES REQUIRED! Pictured here are a typical group of self-contained, radial hydraulic piercing units which Barth is producing for American industry. These units require no punch press and combine the important features of low-cost, precision piercing plus the safety feature of being fed from above. The units are mounted on casters and are readily positioned for line production and storage.









IF YOU HAVE ANY PIERCING JOBS . . . single, multiple or progressive, it will pay you to consult Barth. Write for catalogue.

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Safe Equipment and Keeping It Safe

All who are connected with forge shop operations realize that Safety is never a completed job, but one which is in constant need of improvement. Due to the critical manpower shortage caused by the great increase in the demand for forgings, the past 10 years has seen great strides in forge shop safety.

The type of work in forge shops is such that men are not attracted to seek employment there, even though the pay is relatively high, unless working conditions are comparable to or perhaps better than in other types of industry. Management has come to realize that it is cheaper to spend a few dollars for safety measures than to train new men to fill vacancies on the hammer crews.

by **Roy H. Larson**
Works Mgr.,
Indiana Forge and Machine Co.
East Chicago, Ind.

The health and welfare programs which have come into being in the past decade through management-labor cooperation have also been instrumental in making forge shops a better and safer place to work. Of course, in some cases union committees have been forced to file grievances before awakening management to the need for better safety programs but this I sincerely hope, was not the case in the plants represented here.

After the location of a hammer has been agreed upon we must decide what other equipment will be required to complete the unit, such as furnace press, rolls, containers, conveyors, etc. A careful study must then be made to determine the best way to place the equipment. This must be done in order to provide as much room as necessary for the safety of the operator and at the same time keep to a minimum the number of steps required in the performance of his work. One unnecessary step may prevent any one man from keeping up with other coordinated operations.

If equipment is not spaced properly management will be faced with the necessity of adding the cost of another man to the crew. In placing the equipment, careful consideration must be given to any hazards which may be in the immediate vicinity.

Board hammer shops in the past were, and some still are, faced with the necessity of trying to eliminate the danger from flat belts running overhead between the countershafts and hammers. To you who still have this hazard, I would suggest that you investigate the motor drives sold by some hammer builders and also by another forge company.

I can assure you that installation of such a motor drive will pay for itself in a safer drive, less downtime and increased production. We have had a similar drive in operation in our shop for several years which has proven very satisfactory.

We, at Indiana Forge & Machine Company, have in the past few years rebuilt all of our hammers. They are either Model D or Model F Chambersburg board drop hammers which are not new hammers. In addition to the motor drive we have insisted that all eccentric castings used be cast steel. All roll shaftings have been increased in size for more strength and a high grade alloy steel is used in the shafting. I believe practically all are now machined from Sandow steel supplied by W. J. Holliday Steel Company.

Keyways have been eliminated from the rollers since we believe this to be the cause of many broken shafts. We keep on hand at all times a spare sowblock for each hammer to eliminate the necessity of running extra days. This practice reduces the risk of running dies and also holds the possibility of accidents to an absolute minimum. We keep spare rams on hand for each hammer size; we do not run them after small defects appear. Thermit welding equipment has been purchased for use in repairing rams. We are well pleased with the results.

A welded angle iron framework has been fastened to the motor mount. This we have named a "pulley catcher." Its purpose is to catch the large pulley if it should work loose or if the shaft should break. At the present time we are installing air cylinders to operate the board clamps and

(Continued on page 170)

10" *Precision* TOOLROOM LATHE

Sound design, expert workmanship and quality materials give the 10" South Bend Lathe the dependable performance you want. Equipped with a precision lead screw, thread dial indicator and thread cutting stop, you can use it with confidence for cutting screw threads, making precision gauges or turning out instrument parts.

Another outstanding feature is the 1" collet capacity and 1-3/8" spindle bore which is built on the same design and specifications of larger lathes. The large spindle bore gives you big lathe collet capacity in a small, compact unit.

You will like the way this lathe cuts idle time . . . reduces costs . . . releases big lathes for heavy work. Write for catalog.

SPECIFICATIONS

SWING 10⅛" over bed and saddle wings, 5¾" over cross slide.
COLLET CAPACITY.....1 in.
SPINDLE BORE.....1⅜ in.
BED LENGTHS 3, 3½, 4, 4½ ft.
CENTER DISTANCES.....14¾ to 34¾ inches.
SPINDLE SPEEDS (12) 50 to 1357 r.p.m., approximately.
POWER LONGITUDINAL FEEDS 48 R.H. or L.H. . .0015" to .0836"
POWER CROSS-FEEDS 48 . . . . .0006" to .0309"
THREAD CUTTING 48 R.H. or L.H. pitches, 4 to 224 per inch.

SEND INFORMATION CHECKED:

☐ _____

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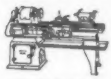
☐ 9" and 10" BENCH LATHES


☐ 10" to 16-24" FLOOR LATHES

☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES

☐ 7" SHAPERS

Name _____ Company _____

Street _____ City & State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 122

Exhibitor	Booth No.
Kelvin Systems Corp.	2050
Kennametal Inc.	1723
Klingelhofer Machine Tool Co.	2000
The Korfund Co., Inc.	1011
Kurt Orban Co., Inc.	1000
Landis Machine Co.	1918
Lapeer Mfg. Co.	325

Latrobe Electric Steel Co.
Booth No. 1732

On Display: A comparison of ground, polished and etched inspection discs cut from "DESEGATIZED" high speed steels and high carbon-high chromium steels with those cut from average process steels; graphic illustrations of Latrobe's modern methods of safeguarding the high standards of "DESEGATIZED" steels.

In Attendance: Representatives of the general office and branch offices.

K. O. Lee Co.	347
Lees-Bradner Co.	2030
Lindberg Engineering Co.	1333
Lipe-Rollway Corp.	1525

F. J. Littell Machine Co.
Booth No. 2013

On Display: Standard roll feeds, reels, straighteners and coil cradles.

In Attendance: F. M. Littell, W. J. Littell, E. W. Littell, S. Budlong, R. Skriba, R. Miller, C. Wiig, E. Poczatek and C. Monell.

Logan Engineering Co.
Booth No. 1130

On Display: New Series 1100 tool room lathe, plus shapers and other lathes.

Logansport Machine Co., Inc.	1529
Lovejoy Tool Co., Inc.	1009
The Lufkin Rule Co.	809
M-B Products	1217
M. B. I. Export & Import, Ltd.	2025
Macklin Co.	841
Magna Engineering Corp.	308
Magnaflux Corp.	501, 1117
Manhattan Rubber Div. Raybestos-Manhattan, Inc.	441
Martindale Electric Co.	1212
Marvin Machine Products, Inc.	1021
Master Mfg. Co.	205
Masterform Tool Co.	109
Jas. H. Matthews & Co.	1318
The McCaskey Register Co.	505
McCrosky Tool Corp.	1227
Mechanical Air Controls	2012
Merz Engineering, Inc.	804
Metal Carbides Corp.	739
Metal Cutting Tools, Inc.	200
Metal Lubricants Co.	1811
The Metal Removal Co.	535
Metalloid Corp.	840

W. F. Meyers Co., Inc.
Booth No. 1826

On Display: Meyco carbide-inserted drill jig bushings, Meyco carbide-tipped circular saws, custom-made carbide cutters of all kinds and the Radiform grinder attachment.

Micro-Lathe-Plate, Inc.	309
Michigan Tool Co.	1200
Micro-Poise Engineering & Sales Co.	818

Exhibitor	Booth No.

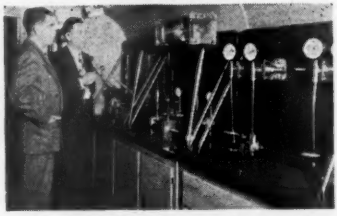
Micrometrical Mfg. Co.
Booth No. 732

On Display: A complete line of surface roughness measuring equipment, including the Q Amplimeter and various tracers for manual and mechanical tracing.

In Attendance: Frank W. Kabat, B. W. Poland, George Haber and Arnold Loyd.

Micro Switch Div. Minneapolis-Honeywell Regulator Co.	416
The Milford Rivet & Machine Co.	2004

Miller Motor Co.
Booth No. 1731



On Display: Cylinders in operation, "boosters," and the "College of Cylinder Knowledge" on wheels. Visitors will be conducted through the "College" to see live-action displays.

A. Milne & Co.	120
Modern Industrial Engineering Co.	1102
Modernair Corp.	412
Moore Products Co.	824

Morey Machinery Co., Inc.
Booth No. 1250

On Display: Machine tools from the following European manufacturers: Raskin—presses; Pegard—boring mills and lathes of all types; Hero, Hure, Jaspar, S.A.B.C.A., Steinel and Werner—milling machines. Also on exhibition will be the Hahn & Kolb line of all types of machine tools along with Morey-made turret lathes, vertical profilers, vertical shapers and heavy duty automatic lathes.

In Attendance: A large contingent from Morey's New York plant, plus representatives from the European companies.

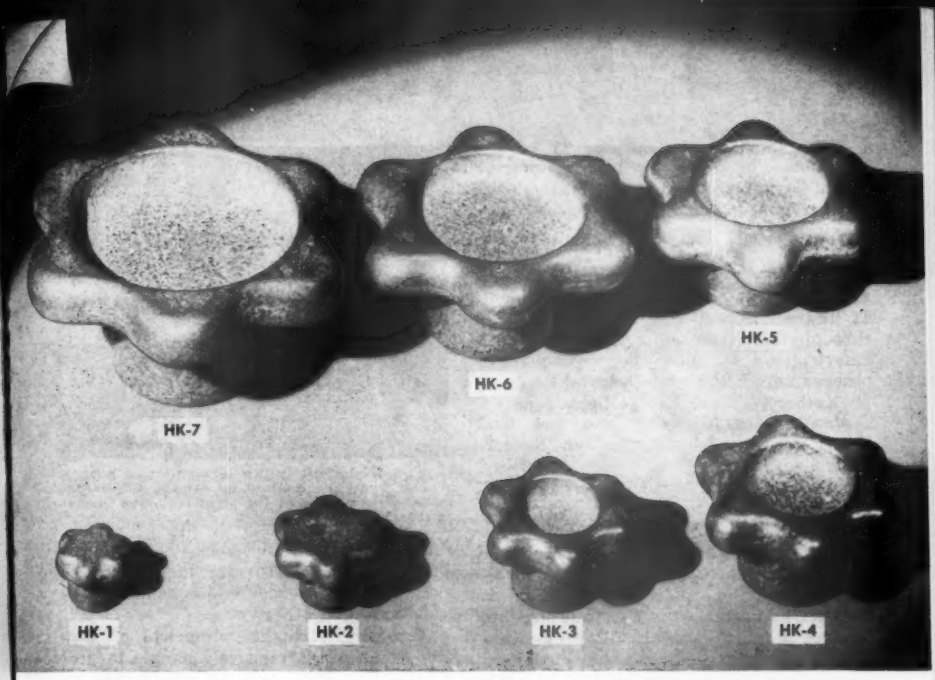
Morton Machine Works	1015
National Broach & Machine Co.	1022
National Machine Tool Co.	232

National Tool Co.
Booth No. 1815

On Display: Many examples of special cutting tools, plus the Pocket Comparator, an optical measuring instrument.

In Attendance: H. W. Barkley, J. B. Clough, Morgan Cragin, N. W. Dorr, Alexander Dubs, Anton Erhardt, Jr., Anton Erhardt, Sr., Harry M. Minor, Robert Nelson and A. J. Ulichny.

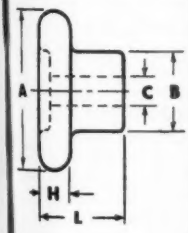
(Continued on page 130)



Special CAST IRON HAND KNOBS

★ 7 sizes, plain or drilled and reamed ★ Order from stock and save!

(order blank)



Quantity	Catalog No.	A	B	C	H	L	Prices F.O.B. Cleveland List Price Drilled & Reamed	List Price Plain
	HK-1	¾	⅜	⅜	¼	⅜	.20 ea.	.08 ea.
	HK-2	1⅛	⅝	¼	⅝	¾	.25	.10
	HK-3	1½	¾	⅝	⅜	1	.30	.15
	HK-4	2	1	⅜	¾	1⅛	.35	.20
	HK-5	2½	1⅛	⅜	½	1¼	.45	.30
	HK-6	3	1¼	⅜	½	1½	.55	.35
	HK-7	3½	1½	⅜	⅝	1¾	.65	.50

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DIE-CO

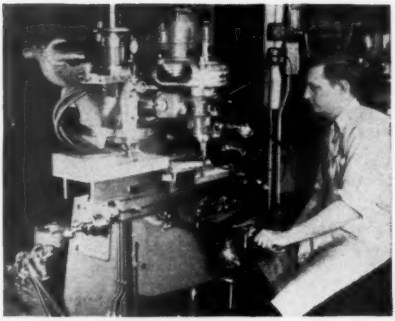
. . . Die Duplicating, from page 71

direction. Therefore, the hobbing process would be dangerous for the operator, were no safeguards employed. Consequently, many of the more powerful hobbing presses are protected with armor plate of sufficient strength and thickness to stop any flying metal in case of an accident. If desired, a peep-hole may be provided through the armor plate, and filled with safety glass, to allow the press man to observe safely the work being done.

Lathes Employed for Die Duplication

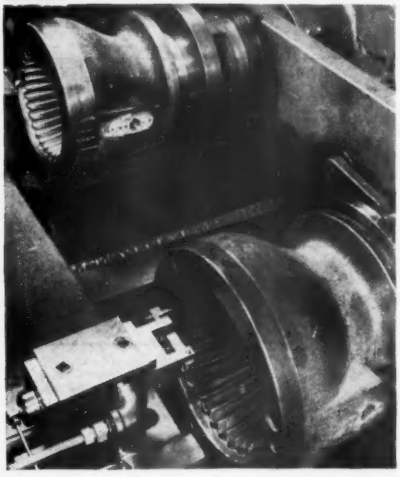
Many types of molds and dies lend themselves for duplication on tracer-controlled lathes. Much tracer-controlled turning is now performed to great advantage. Hydraulic tracer systems are very commonly used in connection with such turning, although electric and electronic tracing systems are also employed.

A template or model of some kind is used as a master where it is desired to produce duplicate molds, dies or other parts. In most instances, a stationary template is used, but there are some cases where it is found necessary to employ a rotating template or model. These different methods allow turning many types of mold and die cavities which could not be lathe-produced otherwise.



Here, a Bridgeport miller is seen fitted with a Walker hydraulic duplicating attachment, reproducing a workpiece at the right from the master at the left.

Close-up of lathe-profiling operation in connection with an ingenious hydraulic duplicating attachment made by Springfield Machine Tool Co. Here, a fluted vase mold is being profile-faced, using another mold as the master. The following stylus is seen at the right, and the cutting tool, in process of machining the new mold, is seen at the left.



Obviously, straight cylindrical or tapered cavities are relatively simple to produce at the lathe. It is also true that so-called oval lathe chucks are available, by means of which elliptical contours having major and minor axes of various ratios may be readily produced.

Much hydraulic duplicating equipment which has been made applicable to lathes is remarkable for the extreme limits of accuracy to which it will trace and reproduce. One of these noted will trace a compound curve, and will accurately follow the flats on a square milk bottle and produce a mold so accurate that variation of content in a two-quart bottle will be kept well within limits specified by law. It will also profile and write simultaneously, bringing out the finest detail of the writing, including periods. The various bottle and tumbler molds produced with such equipment include many which incorporate intricate and fine-detailed designs, which may only be obtained through use of a super-sensitive stylus.

Duplicators for Shapers, Planers and Slotters

Die duplication of certain types is accomplished on hydraulic shapers, planers and slotters through use of a hydraulic duplicator. On such machines, contours or full forms are produced while using in-

(Continued on page 132)

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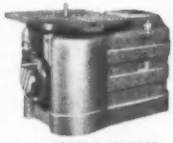

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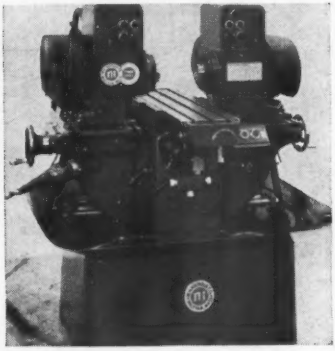
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 126

Exhibitor	Booth No.
Nelco Tool Co., Inc.	410
New Hermes Engraving Machine Corp.	239
Niagara Machine & Tool Works	1313

Nichols-Morris Corp.
Booth No. 1624



On Display: Nichols Twin Mill (illustrated), a two-spindle, duplex type of milling machine; and a semi-automatic, air feed, single spindle miller.

Nicholson File Co.	745
Nilsson Gage Co., Inc.	533
Nord International Corp.	124
C. A. Norgren Co.	1931

Norton Co.
Booth No. 1039

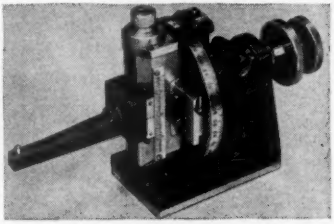
On Display: A new reinforced flexible hub type grinding wheel, the Norton BFR Wheel, designed for use on portable grinders; other grinding wheels, abrasives, abrasives for barrel finishing (including a tumbling barrel in operation) and refractory products.

In Attendance: A. L. Biebel, J. N. Brickman, R. H. Cannon, Paul Carlson, G. F. Colson, F. L. Curtis, G. W. Gidley, W. L. Hardy, F. D. Hart, Jr., W. N. Jove, E. T. Larson, W. J. Mahan, M. M. Maynes, A. S. Rakestraw, G. T. Rideout, W. T. Seiter, C. L. Shaw, W. E. Shumway, I. W. Stanton, E. R. Stevens, J. K. Stevenson, R. E. Taylor, J. R. H. Trulsen, R. G. VanKeuren and F. D. Wing.

The O. K. Tool Co.	1420
Oakite Products, Inc.	132
O'Neil-Irwin Mfg. Co.	1338
Ortman-Miller Machine Co., Inc.	2017
The Osborn Mfg. Co.	1838
O'Vee Spring Gauge Co.	734
Pangborn Corp.	1322
Parker Rust Proof Co.	247
Parkwood Laminates, Inc.	238
Perrish Steel Products, Inc.	1034
Pines Engineering Co.	301
Pioneer Pump & Mfg. Co.	1528
Pioneer Tool & Engineering Co.	547
Pivot Punch & Die Corp.	343
Pratt & Whitney Div. Niles-Bement-Pond Co.	512

Exhibitor	Booth No.

Perfex Gage & Tool Co.
Booth No. 810



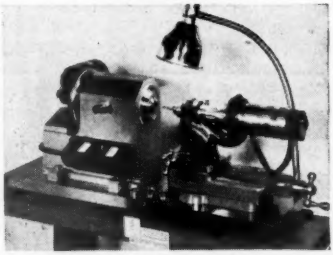
On Display: The new Tangi-Matic Dresser (illustrated) for precision dressing of all angle-tangent-to-radius grinding wheel forms, and a complete line of standard and special thread gages.

Porter Precision Products Co.
Booth No. 1830

On Display: Punches, die buttons and drill fixture.

In Attendance: W. G. Porter, Jr., W. J. Porter and Eugene E. Ader.

Precise Products Co.
Booth No. 1005



On Display: Super 40 and Super 50 Grinder-Millers operating in special, small machine tool setups (illustrated); Super 50 Grinder-Millers mounted in capital machine tools.

In Attendance: Robert Schumann, H. W. Schumann, William Sminkey, Fred G. Roberts, Robert Joris, R. J. Nemec and Harold Martin.

Precision Detroit Co.	1713
Precision Diamond Tool Co.	313
Precision Grinding Wheel Co.	340
Production Machine Co.	2008
Progressive Welder Sales Co.	437
Putnam Tool Co.	439
R and L Tools	408
Racine Tool & Machine Co.	432
Rahn Granite Surface Plate Co.	603
Republic Gage Co.	519

(Continued on page 134)

BIG NEWS about small die sets!*

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DIE-CO

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Die Duplicating, from page 128

expensive masters mounted on the cross rail or the table of the machine. A stylus transfers the form directly to the tool-head through the hydraulic duplicator valve employed. There are no intermediate motions. Consequently, inaccuracies are eliminated.

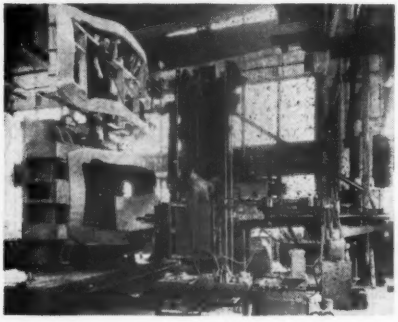
Not only planers, but large horizontal boring mills and other special machines have been used for duplicating work on large dies, through use of hydraulic duplicators. Where a large horizontal boring mill is employed, duplication is performed as a milling operation. Some large dies and other large parts duplicated would be a revelation to the uninitiated.

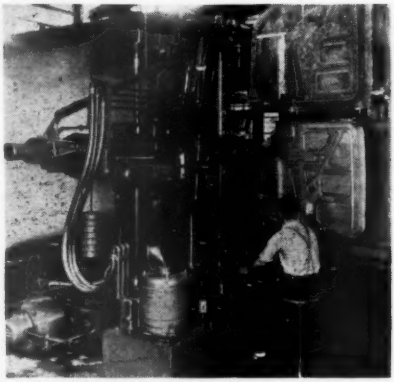
Some very fine duplicators are made up of vertical milling machines so designed that a special duplicator tracer arm and spindle can be attached to them. These duplicators are manually controlled, and reproduce to the exact size of pattern or master used. Since this is true, original dies or molds can be used for templates or masters. Multiple-cavity molds, using the same cavity as a master each time, can be made at a very great saving in time and labor, for it is possible to duplicate the original mold as many times as desired.

Constant Contact Between Tracer and Model

Once the work and the master have been accurately located under the cutter and tracer spindles, respectively, the milling is done by the operator moving the master or template under the tracer. He maintains constant contact between tracer and model, and covers all parts of the model. Lateral motion is given to the machine table by means of a lever at the right. This lever can be used to slide the table easily in any horizontal direction on its ball bearing ways.

Large duplicating job in process, handled by means of a Walker hydraulic duplicating attachment applied to a large horizontal boring mill. Such setups are quite often employed on large automobile dies and similar jobs.





Another interesting duplicating job in process. The walker follower is made to traverse the entire surface of the master, and the cutter reproduces the contour precisely in the workpiece.

Vertical motion necessary for three-dimensional work is controlled by another lever on the left hand of the operator, which moves the tracer and cutter spindles up and down together. Such duplicators are found highly efficient for single or multiple exact reproduction of small and light dies, especially those which have intricate and fine detail, or dies and molds requiring close fidelity to design. These are very sensitive machines. Being manually controlled, they enable an operator to "get the feel" of the work.

In cases where an original mold or die is not available, and where it is necessary to start from scratch as a result, models can be made in various ways and from different types of materials. However, it is always much better to use an original steel die or mold if one is at hand. There are some instances in which only a portion of an older die can be used. In some cases, two or more dies can be combined to make a new one.

Stone Models for Simple Shape Duplication

Where one must resort to use of other materials in starting from scratch, much

(Continued on page 178)

Eclipse Counterbore

Booth No. 526

(PRECISION CONTROL HALL)

Here's an exhibit number to remember—and a cordial invitation to visit us at the ASTE Exposition. We'll be fully manned with factory executives, engineers and sales personnel to chat or "talk shop" with *YOU*.

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ECLIPSE COUNTERBORE CO.

Founded in 1913

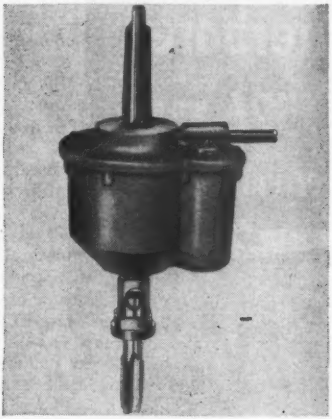
DETROIT 20, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 130

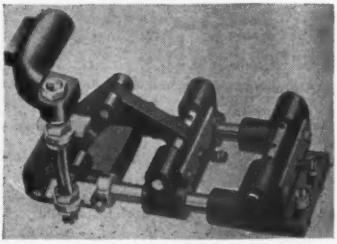
Exhibitor **Booth No.**

Procunier Safety Chuck Co.
Booth Nos. 336, 338



On Display: New "Tap King" heavy duty tapping head (illustrated); universal, foot-operated tapping and threading machines; Style "E" Series high speed tapping heads; new accessories for external threading, stud setting, etc.; Style "H" quick change chucks and collets; and Style "C" friction tap holders.

The Producto Machine Co.
Booth No. 1104



On Display: New "Surefeed" automatic press feed (illustrated), and new design catalog die sets.

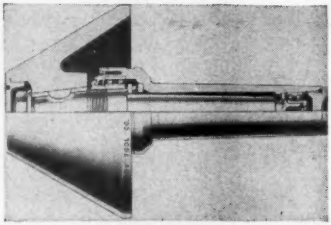
Rivett Lathe & Grinder, Inc.
Booth No. 1027

On Display: operating air valves, air cylinders, hydraulic valves, hydraulic cylinders and hydraulic power units.

In Attendance: Paul A. Fergus, R. C. Taisey, O. W. Wickman, A. B. Hunt, T. B. Williams and J. A. Marsh.

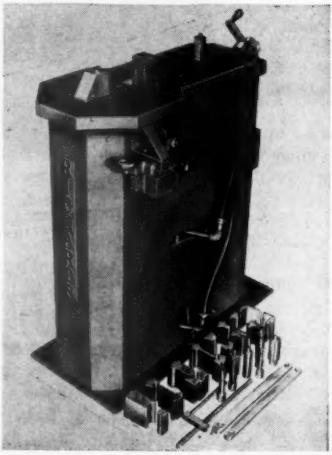
Exhibitor **Booth No.**

The Ready Tool Co.
Booth No. 1017



On Display: Multi-purpose centers (illustrated), carbide-tipped centers featuring a grinding safety "life line," high speed centers, a spinning center, a center for 7" spindles, and a line of machine dogs (reversible, cam action and milling).

J. A. Richards Co.
Booth No. 421



On Display: Late model Multiform benders for hand and air operation, including the air-operated Big Brother unit illustrated.

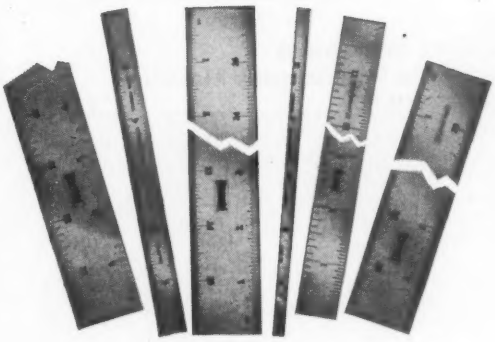
In Attendance: Paul A. Richards and J. A. Richards, Jr.

Joseph T. Ryerson & Son, Inc.
Booth No. 147

Consultation with steel users on problems of application, selection and processing of alloy steels, tool steels, stainless steels and tubular products.

In Attendance: Ryerson metallurgists and other technical men.

(Continued on page 138)



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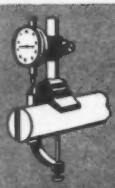

TUMICO POST GAGES
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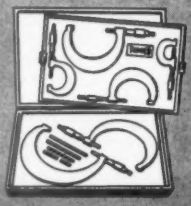
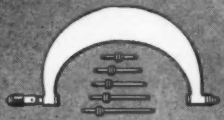


TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.



TUMICO OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3" to 28".

TUMICO VERNIER CALIPERS
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6" to 48".

TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Tank Arsenal Solves One Machine Tool Bottleneck With a Single War Surplus Machine

Production engineers of the Detroit Tank Arsenal and Colonial Broach Company found a way to get around the current long delivery time on new machine tools, when they set out to develop a process that would reduce machining time for cutting the 294 teeth in 6-foot tank turret rings.

They simply looked around the Arsenal, found a World War II surplus Colonial surface broaching machine that could be spared and re-tooled the machine at the Colonial plant to do the new job.

This broaching machine, Figure 1, which does in 30 minutes what former methods took 4½ hours to do, and is already saving $400 per day in the production of turret ring gears, is now in operation at the Detroit Arsenal of Army Ordnance. Manufactured and tooled by Colonial Broach Company, Detroit, the machine cuts the 294 internal 4-pitch teeth in the 6-foot diameter ring gear for tanks in 30 minutes.

According to Army Ordnance officials, at least as much proportionately will be saved as other machines are installed. In addition, the machine eliminates ¾ of the capital outlay and ⅞ of the number of machine tools required in the method perviously used.

Fig. 1. The Colonial turret ring gear tooth broaching machine is shown set up for operation. One of the fixture hydraulic cylinders is at the right of the operator.

Photos courtesy Colonial Broach Co.

Fig. 2. The front view of the turret ring shows it machined preparatory to the tooth broaching operation. The rear view shows it after the tooth broaching operation has been completed. Its size can be compared with the height of the Colonial Broach engineer.

To permit the broaching of the teeth in the large ring, Figure 2, Colonial engineers designed a huge index fixture that encircles the 30-ton, 66-inch stroke vertical broaching machine.

Broaching of the 294 teeth is accomplished by a combination of indexing and shuttle movement of the fixture. In operation the fixture first moves into cutting position under an 11-tooth, 12-segment surface broach 9 inches wide by 60 inches long, Figure 3. After the broach has been passed through the work, the fixture moves out of cutting position and the broach is returned to the top of its stroke. Shuttle movement is accomplished through a hydraulically controlled locking cam action.

Indexing of the turret ring to the next

(Continued on page 140)

There's a RELTOOL Cutter for Every Machine Tool Job!

Whether it's milling or drilling, slotting or reaming . . . or perhaps some special operation . . . chances are there's a Reltool Cutter to do the job efficiently. If special cutting tools are needed, Reltool can supply them to your exact specifications. For fine workmanship . . . at low cost . . . rely on Reltool for your metal cutting-tool needs.

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Reltool CORPORATION
RELIABLE METAL CUTTING TOOLS
4540 WEST BURNHAM STREET • MILWAUKEE 46, WISCONSIN

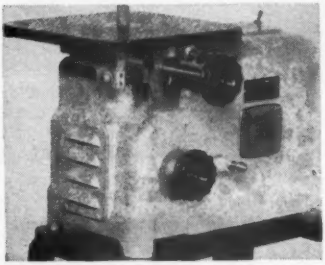
A 6010-1P

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 134

Exhibitor **Booth No.**

Rice Pump & Machine Co.
Booth No. 1214

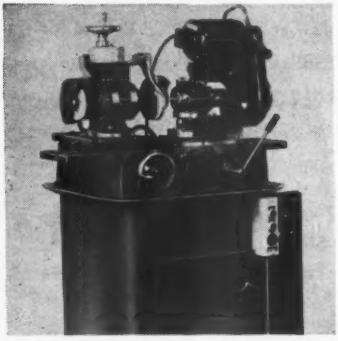


On Display: Standard and high speed profile grinder (illustrated), and Model F and Model FS die filer.

In Attendance: R. D. Houghton, Erwin Losse, C. R. Hoofnagle, E. L. Anderson, C. E. Washburn, Henry J. Schied, M. F. Huesby, C. J. Ketchum, W. S. Brooks, Victor Hammond and J. C. Pittfield.

Ross Operating Valve Co. 2026
H. B. Rouse & Co. 1938

Royal Oak Tool and Machine Co.
(D-S Grinder Div.)
Booth No. 1101



On Display: Manually operated and motor driven models of the D.S. radial relief grinder.

S & S Machinery Co. 1050

Sales Service Machine Tool Co.
Booth No. 1621

On Display: A new 60-ton open-back, inclinable Press-Rite power press; several other Press-Rite press models; the Hy-Duty Keller power hack saw; and Shape-Rite shaper.

Exhibitor **Booth No.**

Salvo Tool & Engineering Co. 352

George Scherr Co., Inc.
Booth No. 601

On Display: A complete line of measuring equipment for taking linear measurements, thread measurements and angular measurements; for profile and form checking; for finish control and for gear testing; plus miscellaneous small tools. New equipment includes "Comparitrol" comparator gage, universal measuring miscroscope and Leitz contour measuring projector.

A. Schrader's Son
Div. Scovill Mfg. Co. 433
Schramm, Inc. 1319

Scully-Jones and Co.
Booth Nos. 1511, 1517

On Display: New "Roll-Lock" mandrels, arbors and chucks, new drill stops, plus floating holders, recessing tools, quick-lock adapters for multiple spindles, heavy-duty tap holders, close center tap drivers, and tension and compression tap holders for multiple spindles.

In Attendance: J. A. Scully, H. D. Long, J. D. Lockrem, Harry Conn, Bernard Better, John Lehde, John Brown, W. Skiba, L. Reid, K. Klare and J. Sklenar.

Seibert & Sons, Inc. 440
The Sentry Co. 1930
Service Diamond Tool Co. 719
Service Machine Co. 1804

Severance Tool Industries Inc.
Booth No. 414

On Display: Midget mills, chatterless countersinks, deburring cutters, ball seat reamers, ball nose drills, taper reamers, and two new undisclosed items.

The Sheffield Corp. 710
Sheldon Machine Co. 1408
Shell Oil Co. 112
Simonds Abrasive Co. 1314
Simonds Saw & Steel Co. 1314

Size Control Co.
Booth No. 704

On Display: New Tesa internal micrometers, reversible plain and thread plug gages, regular and AGD plugs and rings, thread and gear wires and special gages.

Socony Vacuum Oil Co. 233

South Bend Lathe Works
Booth No. 1216

On Display: 16" swing toolroom lathe, other sizes of South Bend lathes, 7" bench shaper, 14" drill presses, plus attachments and accessories.

In Attendance: Two factory representatives.

Special Engineering Service, Inc. 1142

(Continued on page 179)

HARDINGE
ELMIRA, N.Y.

TOOLING For PRODUCTION

STANDARD EQUIPMENT in
Progressive Screw
Machine Plants

Style "S" Master Collets and Pads

Style "B" Master Feed Fingers and Pads

A.S.T.E. SPACE 1516

See the only Master Collet with no work pressure on the screw. Pads are interchangeable among different makes of automatics. Also included will be the complete line of Hardinge Collets and Feed Fingers for all makes of Automatics, Chucking Machines and Turret Lathes.

HARDING-SJOGREN Speed COLLET CHUCK

HARDINGE DRAW-IN COLLETS FOR ALL LATHES AND MILLERS

HARDINGE COLLET INDEX FIXTURES

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Tank Arsenal, from page 136

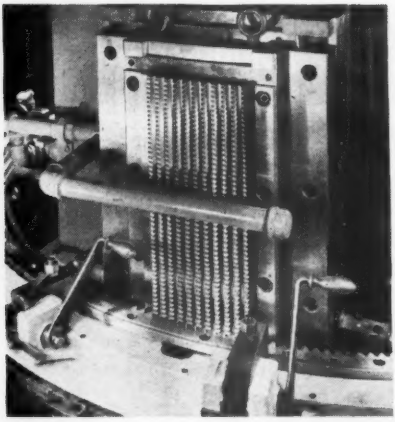


Fig. 3. A close-up of the broaching operation at the last index position. Note the coolant pipe directly above the tooth contact. Two part clamping handles that are mounted on the fixture are also visible.

cutting position is also accomplished by hydraulic cylinders. These rotate the part in the fixture to the next position where a hydraulically controlled index pin locks the fixture in accurate indexing location. The turret ring is clamped in the fixture, Figures 3 and 4, by hand clamps and is ejected hydraulically for unloading. The

Fig. 4. A top view of the fixture with the broach making the last pass to complete the forming of 294 teeth. The hydraulic index pin cylinder is in front of the fixture.

selection of an 11-tooth broach was dictated by the capacity of the machine available at the time.

The teeth formed by the broaching operation are checked while the part is still in the machine. The gage that checks the part both for tooth spacing and size is integral with the index fixture and actually passes through the column of the machine.

The teeth are held to a tolerance of 0.001 inches spacing by the broaching operation.

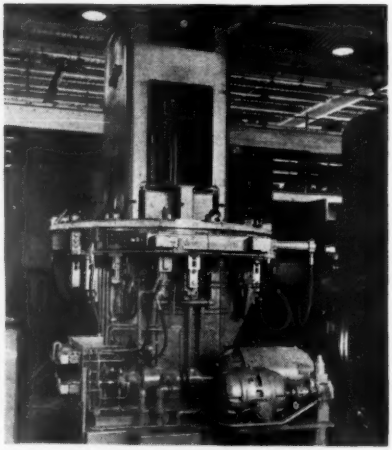


Fig. 5. A rear view of the machine showing one of the fixture index cylinders at the rear of the fixture. All hydraulic power components are on a base at the rear of the machine. Note the rollers on which the fixture slides back and forth into and out of broaching position.

To produce the part to these tolerances required high precision in machining the fixture. Eccentricity on the assembled fixture is less than 0.0005 inches per foot of diameter. Hydraulic power equipment that was formerly within the column of the standard machine is now mounted on a base at the rear of the machine, Figure 5, to facilitate fixture mounting and provide additional hydraulic and electrical control functions.

The machine currently operates on a semi-automatic cycle in which the indexing function is controlled independent of the machine operation.

Hole Location Practices

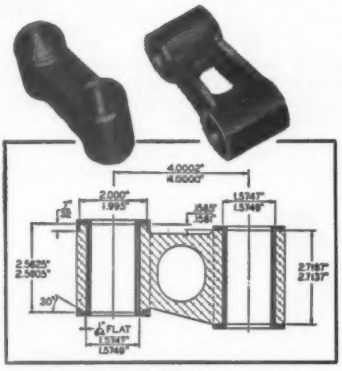
Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc. 726 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

JIG BORING CUTS Production Time 90%

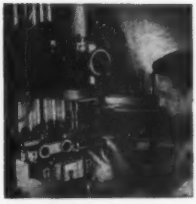
It took 3½ hours to machine each of these aluminum-alloy supporting arms, used on our Moore Panto-Crush Wheel Dresser, on a boring mill. Now—on our No. 2 Jig Borer—it takes only 22 minutes per piece for lots of 100—a time saving of 90%. Hole diameters and between-centers dimensions are held to 0.0002" to insure extreme accuracy between pivot points in the wheel dresser and allow the installation of precision bearings in the holes. Read the job details at the right.

Moore Jig Borers are being used more and more on short-run production of precision work—boring, drilling, reaming and inspecting precisely located and machined holes in production parts as well as in dies, jigs and other tools.

Write today for our new 24-page catalog, containing other examples of time, and cost-cutting Jig Borer operations.

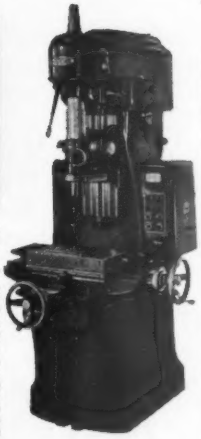


Two holes, three flat and one beveled face and shoulder on one boss (the areas cross-hatched in drawing) are all machined on the Jig Borer—in only 22 minutes.



Checking hole size—held to 0.0002". Simple holding fixture provides both boring and milling positions.

Many examples of jig-boring and jig-grinding practices. 448 pages, 190 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Available at special prices of $3 in U.S.A., $3.50 elsewhere. Send check or money order to Moore Special Tool Co., Inc., Bridgeport, Conn.



No. 2 MOORE JIG BORER

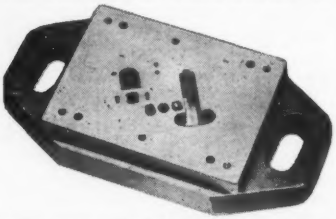
Oper. No.	Operation Name	R.P.M.	Feed	Min.	Sec.
1	Load and mill ribs — Single Point fly cutter	1000	H	1	00
2	Set Up and rough bore — two holes	2000	.0015	2	10
3	Rough face two top surfaces Single Point fly cutter — Remove part to cool —	1000	H	1	35
4	Load and second rough bore two holes	2000	.003	1	50
5	Finish bore two holes	2000	.0015	2	40
6	Check two holes for size			1	00
7	Rough and finish 30° bevel	800	H	3	00
8	Rough and finish one bottom face	800	H	1	00
9	Finish face two top surfaces Out-feed chuck	800	.0025	4	35
10	Rough and finish 2" diameter shoulder	400	H	3	00
	TOTAL TIME			21	50

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

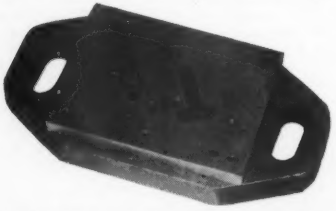
THAT PHOENIX BRAND
TRADE MARK REG U.S. PAT. OFF
HEAT TREATING COMPOUND WORKS LIKE MAGIC!

SAVES MONEY, SAVES HOURS OF COSTLY POLISHING TIME AND ELIMINATES PITTING, SCALE AND DECARBURIZATION!

DIE AFTER HEAT TREATING—USING PHOENIX BRAND COMPOUND.



DIE AFTER ORDINARY HEAT TREATING — NOTE: SCALE, PITTING



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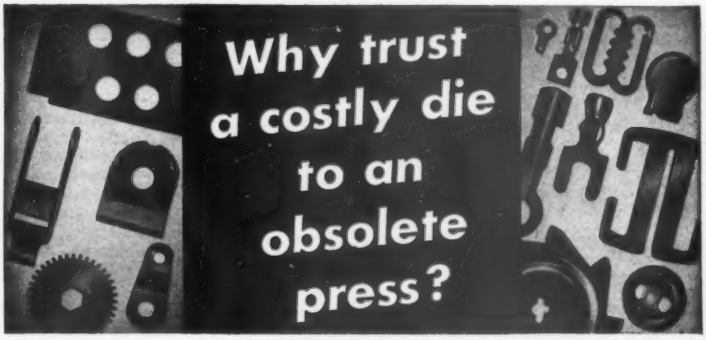
RAYMAC
MANUFACTURING COMPANY INC.
3729 CASS AVENUE, DETROIT 1, MICH.

Pratt & Whitney Opens New Pittsburgh Office

In order to expand its service to its customers in Pittsburgh, Pratt & Whitney, Division Niles-Bement-Pond Company, of West Hartford, Connecticut, has relocated its Pittsburgh office in a new, modern building at 683 Lincoln Avenue, Pittsburgh 2, Pennsylvania.

Additional space provided at the new location permits the company to carry a more comprehensive Pittsburgh stock of regularly listed Pratt & Whitney precision cutting tools and gages, and gives adequate office area for the factory-trained sales and service personnel associated with the large line of machine tools, cutting tools and gages produced by Pratt & Whitney and its subsidiary, Potter & Johnston Company, of Pawtucket, Rhode Island.

The The office is under the management of W. W. Stoner, Jr., district manager. The staff includes E. J. Stokes, machinery sales engineer; J. C. Williams, cutting tool and gage sales engineer; J. R. Cooper, gage sales engineer; J. E. Hecht, office sales, cutting tools and gages; and an adequate office staff.



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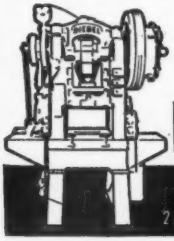


5-8-12 Ton Di-Masters
40 Ton Di-Matic

DIEBEL HI-PRODUCTION AUTOMATIC **PRESSES**

Di Machine Corp.

2708 W. IRVING PARK ROAD • CHICAGO 18, ILL.

For a guide to important savings, write on your letterhead for a new booklet, "Cost Savings thru Precision Stamping"

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

The Liquamatic Wet Blasting Method of close tolerance finishing that assures better, less costly cleaning in the manufacture and maintenance of tools, dies and molds, is fully detailed in Bulletin 23. This American Wheelabrator & Equipment Corp. publication contains advantages, specifications and applications of the Liquamatic unit.
Circle Inform-A-Gram No. B1.

"Little Hustler" Conveyors are presented in a May-Fran bulletin. Completely adjustable and fully portable, they provide maximum efficiency in a wide range of materials handling applications, especially where working heights and areas are subject to frequent change. MAY-FRAN ENGINEERING, INC., 1710 Clarkstone Rd., Cleveland 12, Ohio.
Circle Inform-A-Gram No. B2.

Speed-up DRILL PRESS OPERATIONS
WITH THE HEINRICH Grip-Master SCREWLESS DRILL PRESS VISE
Positive locking by light press on lever.
Instantaneous setting by simple push on knob
Straight through drilling with extra wide clearance.
Hardened and ground bars and locking mechanism.
Large loading and unloading capacity.
Built-in, recessed parallels level work.
(Right) Grip-Master used as base structure to speed up and improve accuracy on a difficult drilling operation.
Cast bosses in stationary jaw for easy jig attachment.
See the Heinrich line ASTE SHOW Chicago—Mar. 17-21 BOOTH No. 232
NATIONAL MACHINE TOOL CO.
DEPT. 132-C
RACINE, WISCONSIN

A Full-Color Booklet, beautifully illustrated, covers the history and development of Swiss automatic screw machines. The booklet, published by Andre Bechler, Ltd., of Moutier, Switzerland, also describes this company's contribution in design for improving the operations and production of these automatic machines. Copies of this excellent, 32-page booklet can be procured from Bechler's representatives in the United States, COSA CORP., 405 Lexington Ave., New York 17, N. Y.
Circle Inform-A-Gram No. B3.

Milne's Kolorkote Hollow Die Steel is described in an informative catalog. For any given finished sizes, Milne Hollow Die Steel weighs 13 to 20% less than corresponding ring forgings. It is stocked in three grades, in sizes from 16" OD x 12" ID to 2" OD x 1" ID. This steel is full-length spray-painted with permanently identifying color. A heat treat card of matching color is furnished with each shipment.
Circle Inform-A-Gram No. B4.

Double-Faced GARNET Finishing Paper is featured in the current edition of Behr-Manning's B-M Bulletin. An application is described in which a stack of this paper is used as a "form-fitting" sander. Address BEHR-MANNING, Div. of Norton Co., Dept. T&P, Troy, N. Y.
Circle Inform-A-Gram No. B5.

New B&L Para-Plane Gages are described in Bulletin D-224. These Bausch & Lomb gages will give "laboratory" accuracy of .000001" in the determination of flatness and parallelism of reflecting surfaces, with production line simplicity and speed.
Circle Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Grinding, Polishing, Buffing Machinery. Twenty-page Catalog No. 75, just released by Hammond of Kalamazoo, pictures and describes a complete line of abrasive belt and grinding, polishing and buffing machinery. It covers bench and floor type wheel grinders; and polishing lathes and backstands of various sizes and capacities for abrasive belt applications. Needed accessories for buffing and polishing operations are also shown. Detailed information and specifications on the Hammond Cyclone and Filter Type Duskolectors complete the catalog. HAMMOND MACHINERY BUILDERS, INC., 1631 Douglas Ave., Kalamazoo, Mich.
Circle Inform-A-Gram No. B7.

Bellows' Three-Color Bulletin T-85 illustrates and describes completely the company's rotary work feed tables. This 16-page booklet shows installation photos, describes in detail all parts of both BRET 22 (standard 22" table top) and BRET 10 (standard 10" table top), including dimensional drawings and specification data. THE BELLOWS CO., Box 631, Akron, Ohio.
Circle Inform-A-Gram No. B8.

The Adjustable Multi-Drill is featured in Commander Mfg. Company's new full-line Catalog No. 851. Model 900 Multi-Drill can drill two to eight holes at one stroke. Quick, easy setups of universally adjustable spindles give more flexibility and wider application.
Circle Inform-A-Gram No. B9.

Grobet Rifflers are now available in more than 126 different shapes. The manufacturer, Grobet File Co. of America, Inc., will honor all requests for Catalog AF-3.
Circle Inform-A-Gram No. B10.

Complex Forms Can Be Dressed in one continuous motion with the J & S Fluidmotion Dresser. Only one setting is necessary for dressing two angles tangent to a radius. This dresser is adaptable to all types of cylindrical and surface grinders. J & S Tool Co., Inc., will send you a copy of its detailed Dresser Catalog.
Circle Inform-A-Gram No. B11.

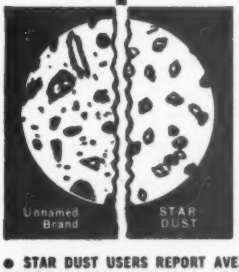
Wittek Roll Feeds, in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes, are shown in the current catalog of Wittek Manufacturing Company. This publication also contains descriptions and illustrations of Wittek Adjustable Reel Stands.
Circle Inform-A-Gram No. B12.

You're LAPS AHEAD with ACE Star Dust

DIAMOND LAPPING COMPOUNDS AND DIAMOND POWDERS

Laboratory Grading Does it!

MIRROR FINISHES IN MINUTES ON DIES, TOOLS, MOLDS AND PRECISION PARTS



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STAR DUST is so accurately crushed and graded by Ace's new laboratory method that it achieves uniform nodular shape, permitting all particles to work. Thus you are assured finishes of less than half a micro inch, quicker than ever before. By contrast, note lack of uniformity and the flats in the "unnamed" brand that prevent accurate finishing!

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ACE ABRASIVE LABORATORIES | 250 WEST 57th STREET NEW YORK 19, N. Y.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Portable Coolant Systems and Pumping Units are the subject of a new Graymills Corporation catalog. This publication includes a selection chart that tells the right pump or coolant system for the job. The coolant systems can be installed in a few minutes, are modern in design and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.
Circle Inform-A-Gram No. B13.

The Light Duty "Autostop" Adjustable, Automatic Stock Feed Stop is featured in Dahlstrom's latest folder. The Autostop will work with blanking, progressive or compound dies. It will handle sheet steel 1/16" x 6" or equivalent and can be mounted on the stripper plate in as little as 15 minutes.
Circle Inform-A-Gram No. B14.

The AMIC Vernier Caliper is presented in American Measuring Instrument Corporation's Circular A. Knife-edged, hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements.
Circle Inform-A-Gram No. B15.

Holes Can Be Pierced at a 90° angle with new Whistler HU-50 Perforating Units. All the facts about this perforating unit are contained in Adjustable Perforating Die Catalog No. 48, available from S. B. Whistler & Sons, Inc.
Circle Inform-A-Gram No. B16.

Rousselle Punch Presses, for high speed production with low annual maintenance, are described in literature sent out by the builder of this line, Service Machine Company of Chicago. OBI, horn and deep-throat presses are pictured.
Circle Inform-A-Gram No. B17.

An Interesting, 52-Page Book of drawings, specifications and prices is obtainable from Noble & Stanton, Inc. It gives full information on the firm's line of more than 300 standard jig and fixture parts.
Circle Inform-A-Gram No. B18.

Nesting Type Tote Pans, made by J. L. Lucas & Son, Inc., are 20" long x 12" wide x 6¼" deep. They have drag holes and handles at both ends. Complete details on these new pans are procurable from the manufacturer.
Circle Inform-A-Gram No. B19.

Challenge Surface Plate Equipment includes angle plates, box parallels, V-blocks, right angle irons and straight edges. Complete information and prices on this precision equipment can be obtained from The Challenge Machinery Co.
Circle Inform-A-Gram No. B20.

Chaso-Royco Tool Co., Inc., serves as a single source of both taps and chasers, assuring uniformity and precision between the two. All tangent type chaser threads are ground from the solid. A descriptive catalog is being mailed.
Circle Inform-A-Gram No. B21.

Hovis Universal Washer Dies provide a master holder and by merely changing five small, easily removable parts the new washer or blank is produced. Hovis Screwlock Corp. will honor requests for literature.
Circle Inform-A-Gram No. B22.

Model A "RFC" Roll Feed is suitable for 4, 6- and 8-ton power presses. It cannot slip and it reverses instantly. Literature covering the complete "RFC" line can be had from Roll-Feeds Corp.
Circle Inform-A-Gram No. B23.

Engraving, Lettering and Design Work (raised or sunken) can be done with the late-model Panto Engravers described in literature just released by H. P. Preis Engraving Machine Company.
Circle Inform-A-Gram No. B24.

"Fascut" End Mills, a complete line that includes the popular three-fluted mill, are described in current literature prepared by Arrow Tool & Reamer Company.
Circle Inform-A-Gram No. B25.

A Complete Cataloging of the full line of new Besly-Bowen radial head face grinders has been made for the first time in a new catalog just issued by Besly-Welles. Desiged as multi-purpose face grinders especially to meet the demands of mass production grinding operations, the Besly-Bowen grinders feature a Quadri-Trans radial head and have been engineered for adaptability and flexibility of control. The catalog provides complete specifications and examples of cost-cutting grinder applications. BESLY - WELLES CORP., Grinder Div., Dept. T&P, Beloit, Wis.
Circle Inform-A-Gram No. B26.

EveredE Boring Bar Holders can be precision-set quickly for production boring on turret lathes. Complete information and literature can be obtained upon request to EveredE Tool Co.
Circle Inform-A-Gram No. B27.

Standard Comparator Charts for all optical projectors are described in a bulletin from the Gage Company. These moderately priced charts are available in 31.25x, 50x and 62.5x.
Circle Inform-A-Gram No. B28.

Your Engine Lathe can be converted to a turret lathe with the Jefferson 5-Tool Tail Stock Turret. Four sizes up to 24" swing are shown in a folder from Jefferson Machine Tool Company.
Circle Inform-A-Gram No. B29.

Leslie Model A Hand Punch Press is shown in an illustrated circular. This publication also covers punches and dies that are available from stock of Leslie Welding Company.
Circle Inform-A-Gram No. B30.

Black Panther Cutters and Blanks are described in a catalog sheet from Edward D. Strand Co. Prices are given for all hardened cutters and blanks, which are manufactured to exact specifications.
Circle Inform-A-Gram No. B31.

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JIFFY MANUFACTURING COMPANY

360 FLORENCE AVENUE ★ HILLSIDE, NEW JERSEY

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

A Large Assortment of Small Tools is described in Precision Supply & Machine Company's new illustrated catalog. Polishing wheels, brushes, abrasives, mounted wheels and points, mandrels, flexible shaft equipment, and diamond compounds and tools are included.
Circle Inform-A-Gram No. B32.

The Heavy Duty Shoplifter now has new accessories that make it easy for one man to move heavy dies up to 2000 lbs. from storage racks to inclined bed of press. Economy Engineering Co. will furnish literature.
Circle Inform-A-Gram No. B33.

R-B Punches, Dies, Retainers and other diemaking parts are fully covered in Allied Products Corporation's attractive, 52-page catalog. The new R-B Extra Heavy Duty Retainer brings the economies of interchangeability to the hole-making formerly done by drills or without interchangeable punches.
Circle Inform-A-Gram No. B34.

All the Facts on Brighton Nu-Process and Uni-Quality are contained in a detailed catalog from Brighton Screw & Mfg. Co., manufacturer of B-Right-On Socket Screws.
Circle Inform-A-Gram No. B35.

Carblox in spite of its higher initial cost is the least expensive gage block that you can afford.

All gage blocks are delivered with an accuracy measured in millionths. The accuracy is held until wear makes it necessary to discard them. Carblox avoids this point of diminished accuracy as wear is practically non-existent. It is made with a special alloy of carbide and lasts indefinitely. In normal usage that would be a lifetime.

Carblox has attracted many interested users but deliveries were impossible to promise. However, they are now in better supply and can be had within a reasonable time after order is received. Write for literature.

Thermo-Guards for even greater precision

The Webber Gage Co., 12903 Triskett Rd., Cleveland 11, Ohio

Webber
Micro-Accurate Gage Blocks & Fixtures

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

Instrument Manufacturing and Tooling Programs carried on by Daco Machine & Tool Co. are described and pictured in an eight-page publication just issued. The booklet is the first issue of a new quarterly magazine, "DACO DOINGS." It includes excellently illustrated sections on Daco's modern toolmaking facilities. Development and research laboratory facilities for testing aircraft instruments are also covered. Those interested in having their names added to the mailing list now being formed can do so by requesting copies from DACO MACHINE & TOOL CO., 202 Tillary St., Brooklyn 1, N. Y.
Circle Inform-A-Gram No. B36.

The "Standard" Vertical Spindle Grinder is among the many outstanding units described in Catalog 44 of The Standard Electrical Tool Co. This "double purpose" machine is made in sizes from ½ hp to 25 hp. Speeds of 1200, 1800 or 3600 are available for cup or plate mounted cylinder type of wheel. It is excellent for application to planers, boring mills, shapers, milling machines.
Circle Inform-A-Gram No. B37.

South Bend 10" Precision Lathes are the subject of Bulletin 5135. The bulletin fully describes and illustrates features that make for speed, accuracy and convenience. Also included are a list of brief specifications and a list of the names and locations of South Bend Lathe distributors. SOUTH BEND LATHE WORKS, Dept. T&P, South Bend 22, Ind.
Circle Inform-A-Gram No. B38.

All Long-Length Bushings listed as standard in the latest Universal Engineering Company catalog are regular stock items. This means speedier delivery—no waiting for production. The catalog is obtainable upon request from the Frankenmuth, Mich., manufacturer.
Circle Inform-A-Gram No. B39.

High-Speed Production Lathes, electronically controlled, are being imported from Germany by Guthery Machine Tool Corp. for sale in the United States. Built by Eugen Weisser & Co., these lathes are the subject of a detailed catalog now available to T&P readers. The catalog lists 17 advantages of the Model PZ 165 lathe, illustrates a few typical jobs turned on the PZ 165, and gives complete dimensions and specifications. GUTHERY MACHINE TOOL CORP., 130 W. 42nd St., New York 18, N. Y.
Circle Inform-A-Gram No. B40.

New Barrett "Hi-Lift" Power Ox Electric Trucks are pictured in Bulletin 5143. This colorfully illustrated booklet presents, with full specifications, four compact "walkie" units, designed for lifting, moving and stacking heavy loads with minimum labor expenditure. Send requests to BARRETT-CRAVENS CO., 4609 S. Western Blvd., Chicago 9, Ill.
Circle Inform-A-Gram No. B41.

The Orlandi Gear Checker, which checks pitch diameter of spur and helical gears with pins and balls, is presented in a current pamphlet. Precision checking can be done on a production basis with this machine. The pamphlet illustrates all the jobs that can be done. ORLANDI GEAR & MACHINE CO., 16195 Meyers Rd., Detroit 27, Mich.
Circle Inform-A-Gram No. B42.

Carboloy Die Engineering Manual D-124 contains vital facts to assist you in proper application techniques of cemented carbides to dies and punches for more efficient sheet-metal drawing, forming, blanking, etc.
Circle Inform-A-Gram No. B43.

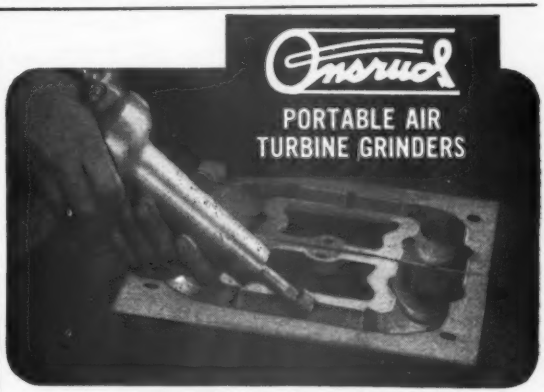
Etalon Calipers. Alina Corporation of New York City offers a 16-page catalog covering a complete line of precision calipers, micrometers and dial micrometers.
Circle Inform-A-Gram No. B44.

Wells No. 8 Metal Cutting Band Saw is presented in literature recently published by Wells Mfg. Corp. The No. 8 has a capacity 8" x 16", rectangular, 8" dia., rounds. It is powered by a heavy-duty ½ hp motor. Other available sizes are described in the literature.
Circle Inform-A-Gram No. B45.

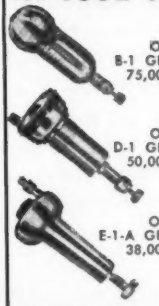
An Inexpensive Method of drilling holes of various shapes is explained in Watts Bros. Tool Works' current catalog. By this system, square, triangular, pentagonal, hexagonal and octagonal holes can be drilled.
Circle Inform-A-Gram No. B46.

750,000 Drill Bushings in Stock are your assurance of prompt service from Ace Drill Bushing Co. The manufacturer offers descriptive literature on these durable bushings, which are precision made and lightwave tested for .0003" maximum tolerance.
Circle Inform-A-Gram No. B47.

Peaslee Engravers' Cutters are covered in Bulletin 10. Immediate delivery is promised on these close tolerance cutters. They can be used on high speed milling machines, duplicators, pantographs and die sinkers.
Circle Inform-A-Gram No. B48.



for TOOL ROOM or PRODUCTION work



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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

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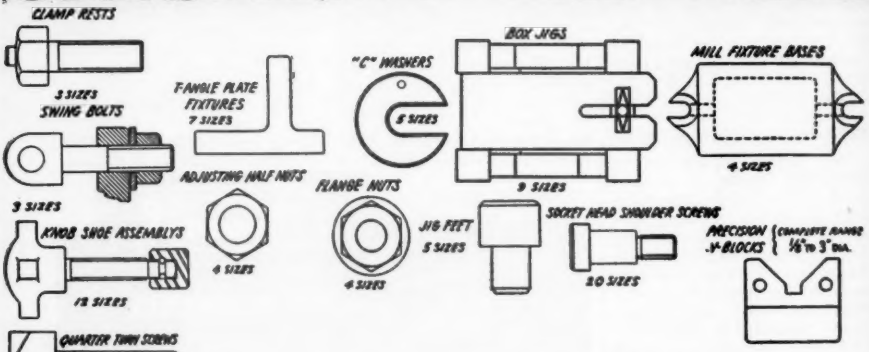

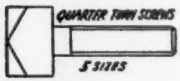

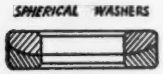

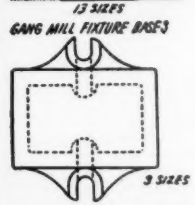

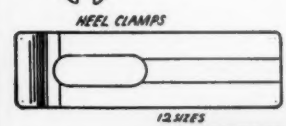

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12	29	46	83	111	142A	161	179B	193D	201C	214	222A	228A	230M	
13	30	47	85	112	142B	162	182	195A	203A	215A	222B	228B	230N	
14	31	48	86	113	142C	163	183	195B	203B	215B	222C	228C	230P	
15	32	49	88	115	143	164	184	195C	206A	215C	223A	229A	230R	
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17	34	51	91	119	145	167	185B	197A	206C	215E	225A	229C	231A	
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Johnson Metal Cut-Off Band Saws allow you to make full use of present steel stocks. These saws can cut material you have in stock to the size you now need. A detailed catalog is obtainable from Johnson Mfg. Co.

Circle Inform-A-Gram No. B49.

Danly's Latest Die Set Booklet shows you how to save tooling time. It highlights the unique precision features of these die sets. Copies are being distributed by Danly Machine Specialties, Inc.

Circle Inform-A-Gram No. B50.

Simonds Abrasive Grinding Wheels are a part of a complete line including mounted wheels and points, segments and abrasive grains—all accurately specified, rigidly tested and scientifically produced under complete quality control. Simonds Abrasive Company offers a free data book to T&P readers.

Circle Inform-A-Gram No. B51.

The AMC Demagnetizer is described in an Alois Mfg. Company circular. One pass through this improved demagnetizer removes all magnetism from processed parts.

Circle Inform-A-Gram No. B52.

40 Years
1912 - 1952
Over this long period we have helped many large and small metal working plants control cutting tool costs through efficient salvaging programs.
Regrinding and rebuilding of HSS and carbide tools.
We manufacture carbide drills and center drills for cutting hardened steel.
Representatives in all industrial areas.
National TOOL SALVAGE CO.
6511 Epworth Detroit 10, Mich.

A Technical Bulletin (No. 500-C) covering its improved Model "C" automatic roll marker for screw machines has been issued by New Method Steel Stamps, Inc. The simple manner in which the roll marker can be used to eliminate secondary operations, improve marking clarity and reduce cost is described and illustrated. Instructions for operation and data on setup, use of offset dies, correct location of starting pad, ordering markers or dies, etc., are included. NEW METHOD STEEL STAMPS, INC., 147 Jos. Campau St., Detroit 7, Mich.

Circle Inform-A-Gram No. B53.

Packaging Time and Labor can be saved by suppliers of materials for the military, such as machined metal parts, bearings, radio and electronic devices, etc., by use of the Crimpmaster Model "B" bench-type, foot-operated heat sealer. Operated on 110-volt ac or dc, the Crimpmaster provides an airtight, liquid-tight and moisture-tight seal with thermoplastic materials. Literature giving full details is obtainable from the manufacturer, CLEVELAND LATHE & MACHINE CO., 676½ Broadway, Cleveland 15, Ohio.

Circle Inform-A-Gram No. B54.

Precision Jeweler's Lathes, accessories and Micro-Drill Presses, all manufactured by Louis Levin & Son, Inc., Los Angeles, are covered in the company's general catalog. The lathes are excellent for second operations or experimental work on small instrument parts where sensitivity is required. The Micro-Drill Press is an extremely sensitive drill press for very small drills down to .002".

Circle Inform-A-Gram No. B55.

The Zagar Engineering Manual includes dimensional drawings and detailed data on all models of broaching machines, collet fixtures and multiple spindle, gearless drill heads. Also contained in this booklet are several action photos.

Circle Inform-A-Gram No. B56.

The Sel-Lok Spring Pin, a heat-treated, tubular slotted dowel pin made in both standard and light-duty types, is the subject of a recent catalog published by Self Lock Fastener Corp. An inexpensive, highly efficient hollow pin with chamfered ends, it permits easy and rapid insertion. The pin becomes compressed as it is driven or pressed into place. When the pin is placed into the hole, it remains tight and secure against vibration but can be removed with a drift punch if necessary. SELF LOCK FASTENER CORP., 259 Stephens St., Belleville 9, N. J.
Circle Inform-A-Gram No. B57.

Armstrong Carbide Tool Holders and Armide Carbide-Tipped Cutters are featured in a colorful bulletin. Besides photographs, dimensions and descriptions, the bulletin gives useful suggestions on the proper care of the Armide cutters. Address ARMSTRONG BROS. TOOL CO., 5220 W. Armstrong Ave., Chicago 30, Ill.
Circle Inform-A-Gram No. B58.

"Friction Sawing," an informative Tannewitz booklet, lists the time-and money-saving advantages of friction sawing with Tannewitz High Speed Band Saws. According to the booklet, flat sheets of either soft or hardened steels, nonferrous materials can be cut in a fraction of the time required by other methods.
Circle Inform-A-Gram No. B59.

Carbide Gage Blocks are pictured in current literature published by Fonda Gage Company. Features of toughness, wear resistance, accuracy and good wringability are pointed out.
Circle Inform-A-Gram No. B60.

Horberg Drill Size, Pin Gages are described in detail in new literature. They provide unlimited time- and cost-saving advantages in center and location finding, hole or slot gaging.
Circle Inform-A-Gram No. B61.

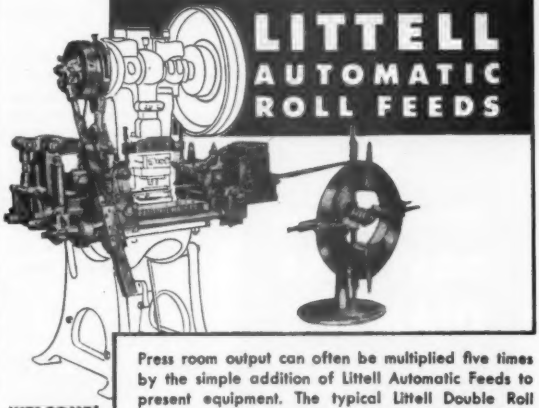
The Levermatic Collet Chuck is described by text and pictures in an eight-page catalog issued by Sutton Tool Co. The catalog details outstanding construction features. These include pressure adjusting ring with ball detent lock, positive cam closing collar, three hardened cam levers and parallel grip design collet.
Circle Inform-A-Gram No. B62.

The Magna-Sine provides positive accuracy for any angular setup, whether single or compound. The current Magna-Sine Catalog is being sent out by Omer E. Robbins Co.
Circle Inform-A-Gram No. B63.

Your Entire Stock of Drills can be seen at a glance when you have a Huot Drill Dispenser. A new circular tells how time can be saved by this dispenser, which has compartments holding a gross of small sizes or a dozen or more of the larger ones. Three models are described in the circular.
Circle Inform-A-Gram No. B64.

Handnibs, made by National Machine Tool Co., shear and nibble (outside and inside) up to 3/16" flat stock. They have openings for cutting 3/16" ¼", 5/16" and ⅜" rods. Detailed literature has been printed.
Circle Inform-A-Gram No. B65.

RAISE PRESS OUTPUT WITH
LITTELL AUTOMATIC ROLL FEEDS



Press room output can often be multiplied five times by the simple addition of Littell Automatic Feeds to present equipment. The typical Littell Double Roll Feed shown here grips the stock on both sides of the die to assure maximum traction and feeding power. Stock is easier to start and finish in progressive die work. No hand feeding at either end of the stock. Rack and pinion drive provides the smoothness and the gradual acceleration and deceleration of feed rolls for a truly accurate feed. Standard Littell Automatic Feeds serve all types and sizes of presses, handle all standard widths and thicknesses of stock.

WELCOME! VISIT LITTELL Booth 2013 ASTE Show Chicago March 17-21

F. J. LITTELL MACHINE CO.

ROLL FEEDS • DIAL FEEDS • STRAIGHTENING MACHINES • REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland
4197 N. Ravenswood Ave., Chicago 13, Illinois

WHEN YOU BUY FROM LITTELL... YOU PURCHASE A PACKAGE OF SATISFACTION

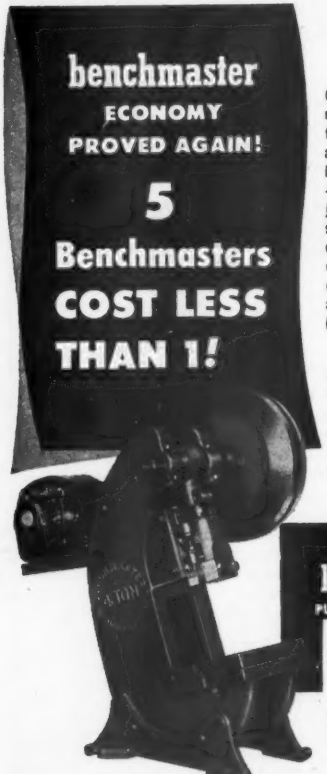
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Big Machine Performance at small machine cost is claimed in an informative circular describing the features of Boyar-Schultz Corporation's No. 6-12 Surface Grinder. Its speedy and proper location of controls makes it unusually convenient to operate.
Circle Inform-A-Gram No. B66.

Hardness Testing for all types of applications can be done with one of The Shore Instrument & Mfg. Company's Scleroscope models. Illustrated literature covering these instruments is offered to T&P readers.
Circle Inform-A-Gram No. B67.

Surplus Tools, Machines and Parts are the subject of a 200-page catalog from Palley Supply Company. Outstanding savings in hand and power tools, machine tools, gages, welding equipment, hydraulic supplies and hundreds of other items are featured.
Circle Inform-A-Gram No. B68.

Both Angular and Parallel Misalignment are corrected by the Erickson Full Floating Holder, featured in Catalog G. For use with reamers, taps, die heads and other tools, this holder comes in collet, bushing and taper types.
Circle Inform-A-Gram No. B69.



One operator used his Benchmaster press for all 5 stages of a forming operation. Die changes and set-ups proved costly—both in time and lost production. NOW —5 Benchmasters do the same job, each handling a separate stage. Tooling is never changed or removed. Savings in time and extra output have paid off the entire cost and **continue to pay a high dividend on a low investment!**

There's a low-cost Benchmaster for every requirement—1 Ton, 4 Ton, 7½ Ton and Deep Throat models. Write for literature or see your dealer.

benchmaster
PUNCH PRESSES AND MILLERS
1835 W. Rosecrans Ave.
Gardena, California
See our Booth No. 1805 at the March ASTE Show
World's largest manufacturer of small punch presses and milling machines.

An informative Bulletin on SPEE-DEE whiteprinting outfits has been issued by Peck & Harvey. This colorful bulletin pictures and describes portable whiteprinting outfits that make it quick and easy for anyone to produce sharp, clear, easy-to-read black, blue, maroon or sepia line positive prints by the moist-diazo (semi-dry) or the ammonia-fume (dry) method. It also gives facts about the whiteprinting process and important suggestions about printing and developing for speed, economy and utility. Write to PECK & HARVEY, 5736 N. Western Ave., Chicago 45, Ill., and ask for Bulletin 250.
Circle Inform-A-Gram No. B70.

The No. 2 Moore Jig Grinder is a completely redesigned version of the original Moore Jig Grinder. It contour grinds, chip grinds and slot grinds as easily as it hole grinds. An eight-page reprint of a technical article on the design of this jig grinder can be obtained from Moore Special Tool Co., Inc.
Circle Inform-A-Gram No. B71.

A Detailed Data Book on all Hy-Ten Alloy Steels is offered by Wheelock, Lovejoy & Co., Inc. One of the steels described therein is Hy-Ten "M" Temper Alloy Steel, which has great toughness at high degrees of hardness and long-wearing properties for lowest unit cost.
Circle Inform-A-Gram No. B72.

"De-Sta-Co" Toggle Clamps are made in more than 40 models to solve any problem in production work-holding. The current Detroit Stamping Co. catalog contains descriptions and illustrations of the whole line.
Circle Inform-A-Gram No. B73.

Whyte Roll Feeds assure fast, accurate, continuous feeding, according to an illustrated folder from the manufacturer. This publication fully details all the advantages of these feeds.
Circle Inform-A-Gram No. B74.

McKenzie Chip Separators, in floor- and bench-type models, are described in new catalog sheets. The separators are used for separating chips from screw machine production of various metals and other materials. The floor model will handle parts ranging from 3/16" to 2" dia., and from ¼" to 5" long at a rate of up to 5000 parts per minute. The bench model is designed for small screw machine parts including instrument and watch parts, up to ½" x 1". McKENZIE ENGINEERING CO., Dept. T&P, S. Main St., Newton, Conn.
Circle Inform-A-Gram No. B75.

Multi-Speed and Reversing Magnetic Motor Starters. The Arrow-Hart & Hegeman Electric Co. has published an eight-page folder illustrating a line of "RAS" and "RAR" motor starters. The folder gives dimensions, weights and ratings for these across-the-line starters, which are only half the size and weight of conventional starters. Write THE ARROW-HART & HEGEMAN ELECTRIC CO., Industrial Control Div., 103 Hawthorn St., Hartford 6, Conn.
Circle Inform-A-Gram No. B76.

The Multi-Max Punch Press Catalog, released by Diamond Machine Tool Co. of Los Angeles, covers a complete line of presses for fast production on light-gauge, large-panel metal stampings. These presses feature a rated capacity of 30 tons and operate at 80 strokes per minute.
Circle Inform-A-Gram No. B77.

DIE-CO Die Springs are presented in an illustrated, 10-page catalog, designated Bulletin 1951. Dimensions and prices are given for all types of springs. A current discount sheet is attached.
Circle Inform-A-Gram No. B78.

The Nobur Tool Eliminates hand methods, makes hole deburring a speedy machine operation. A pamphlet from Nobur Manufacturing Company gives full details.
Circle Inform-A-Gram No. B79.

The Vulcanaire Jig Grinding Attachment permits finish grinding of holes in hardened steel to "tenths" at speeds of from 30,000 to 65,000 rpm. A manual of photos showing operations the Vulcanaire performs is being mailed by Vulcan Tool Co.
Circle Inform-A-Gram No. B80.

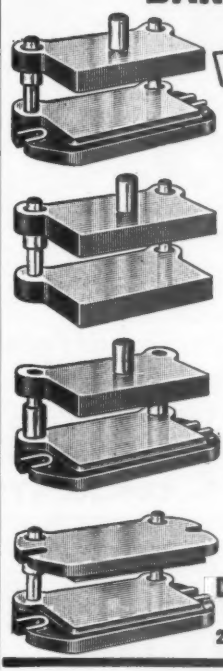
Milwaukee Surface Plates are fully described in a catalog from J. C. Busch Co. These surface plates are finish-planed and scraped to insure a highly accurate surface. Standard plate sizes range from 3¼" x 4" to 48" x 96".
Circle Inform-A-Gram No. B81.

Linderme Two-Spindle Adjustable Drilling Heads drill two holes at a time, feature variable drilling center adjustments that are quickly made by merely loosening two hex nuts. New literature has been prepared by Linderme Engineering & Sales.
Circle Inform-A-Gram No. B82.

Bellows "Controlled-Air-Power" Working Holding and Clamping Devices are pictured and described in Bulletin 761. This publication shows how these devices will fit advantageously into your production picture.
Circle Inform-A-Gram No. B83.

For Light Work on Small Power Presses Where Extreme Accuracy Counts . . .

DANNEMAN *Precision* **Style "B" DIE-SETS**



- Surfaces precision ground.
- Die shoes and punch holders precision bored on master-plates.
- Leader pins and bushings assembled with cylinder square fixtures assuring accurate alignment.
- Absolute interchangeability between die shoes and punch holders.
- Solid shank punch holders furnished in diameters from 1" up to and including 1½".
- Style "B" Die-Sets can be furnished in combinations as illustrated.
- Style "B" Die-Sets carried in stock in the following die areas: 3x3, 4x3, 4x4, 4x5, 4x6, 5x3, 5x4, 5x5, 6x3, 6x4, 6x5, 6x6, 7x3, 7x4, 7x5.

Write for information!

DANNEMAN DIE-SET DIVISION
ACME-DANNEMAN CO., Inc.
213 Lafayette St. • New York 12, N. Y.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

An Up-to-Date Stock List of 52100 Steel Tubing and Bars has been issued by Peterson Steels, Inc. This versatile steel is hard, tough and long-wearing, yet it is easy to machine and is right for bearings, sleeves, pins, collars and many other machine parts.
Circle Inform-A-Gram No. B84.

Milwaukee Model FS Die Filer features a new all-purpose, deep-throated overarm and can perform all tool and die making operations at low cost. Rice Pump & Mfg. Co. can supply literature.
Circle Inform-A-Gram No. B85.

Nu-Matic Air-Inflated Grinders can boost your buffing and polishing output up to 3000% on flat work, and 600 to 700% on contours, according to literature offered by Nu-Matic Grinders, Inc., of Cleveland. They can be used on portable tools or bench-stands.
Circle Inform-A-Gram No. B86.

Acme Drill Jig Bushings are described as to price and size in a current catalog. These bushings, produced by Acme Industrial Co., are accurate, interchangeable and concentric.
Circle Inform-A-Gram No. B87.

A Water Soluble Compound has been developed by United States Products Co. for the lapping of brass and bronze plug valves. Compounds in four different grades of grit sizes are available—coarse, medium fine, fine and extra fine, to suit all plug valve lapping requirements. The suspending medium is soluble in water, permitting finished parts and machines to be cleaned with ordinary water and without recourse to solvents or strong alkalis. For further information and samples, write UNITED STATES PRODUCTS CO., 518 Melwood St., Pittsburgh 13, Pa.
Circle Inform-A-Gram No. B88.

Extensive Die Set Catalog. What is said to be the largest catalog of die sets and diemakers' supplies ever published has been released by E. A. Baumbach Mfg.Co. This firm has been making die sets for 40 years and is one of the largest in the business. Write for the catalog to E. A. BAUMBACH MFG. CO., 1816 S. Kilbourn Ave., Chicago 23, Ill.
Circle Inform-A-Gram No. B89.

Littell Style "M" Automatic Roll Feed will enable your press to produce 9000 stampings an hour at 200 strokes per minute, or 4600 stampings an hour at 100 strokes per minute, according to the manufacturer's latest catalog. Other features of versatility, adaptability, safety, durability and economy are detailed in the catalog.
Circle Inform-A-Gram No. B90.

All Types of Holding Fixtures for machine shop production are designed and built by Swartz Tool Products Co., Inc. There are 75 models and fixture sizes from which to choose. Catalog 941 gives all the facts.
Circle Inform-A-Gram No. B91.

A New Perkins Straight Side, Single Crank Power Press is introduced in literature just out. Model 12-H-36 is a tie rod press with 200-ton capacity, 8" main bearing diameter, and bed area of 36" x 36".
Circle Inform-A-Gram No. B92.

A Quick, Easy Way to tin formerly hard-to-tin surfaces, rust-proofing metal and re-galvanizing spots where damage has destroyed original surface, is described in All-State's latest miniature folder. Key to this job is the "KROM-OVER" touch-up pencil that is almost as quick and easy to use as an eraser. Unlike tin-plating, it sacrifices itself to protect the iron or steel on which it is applied, thus forming a better protective coating than tin-plating. ALL-STATE WELDING ALLOYS CO., INC., 249-255 Ferris Ave., White Plains, N. Y.
Circle Inform-A-Gram No. B93.

New Applications for the Lectroetch Electrolytic Stencil Etching Process are described in a colorful bulletin. This improved inspection marking system permits the application of process and final inspection symbols to metal tools, parts and gages. Simplified, repetitive marking of metal parts can be done with new miniature hand pads.
Circle Inform-A-Gram No. B94.

The Strand Enclosure Safeguard is designed to protect the hands of punch press operators. This guard is easily adapted to accommodate various dies. Complete details are contained in a catalog sheet released by Strand Manufacturing Company of Los Angeles.
Circle Inform-A-Gram No. B95.

Model B800 Tool and Cutter Grinder is a highlight of the K. O. Lee Company line that is described in current, illustrated literature. Specifications and outstanding features of this low-cost machine are listed.
Circle Inform-A-Gram No. B96.

How to Select, Use and Care For the right file for the job is interestingly described in text and pictures in Nicholson File Company's well-known, 48-page booklet, "File Filosophy."
Circle Inform-A-Gram No. B97.

Dykem Steel Blue stops losses in the making of dies and templates. The dark blue background makes the layout lines show up in sharp relief, and at the same time prevents metal glare. Full information can be had by writing to The Dykem Company.
Circle Inform-A-Gram No. B98.

Johnson Furnace Catalog No. 51, a 24-page booklet, illustrates and describes the Johnson Gas Appliance Company line of furnaces, burners, valves, torches, mixers and blowers.
Circle Inform-A-Gram No. B99.

The Mead Air Operated Rotary Work Feeder is featured in the company's Air Power Catalog. This work feeder deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations are accurate to .002".
Circle Inform-A-Gram No. B100.

T-Nut and Stud Sets, step block sets, punch press sets, jig feet, screws, hand knobs and many other tool specialties are described in the extensive catalog published by Northwestern Tool & Engineering Company.
Circle Inform-A-Gram No. B101.

PAYS FOR ITSELF ON "HARD-TO-GET-AT" JOBS

DREMEL *Electric* MOTO-TOOL

"THE POCKET-SIZE MACHINE SHOP"

GRINDING DIES

SHARPENING CUTTERS

BURRING PARTS

MOST POWERFUL TOOL IN ITS CLASS — APPROX. 27,000 R.P.M.

Dremel Moto-Tools, widely used in industry for over 15 years, are World War II veterans—served in defense plants and military maintenance bases everywhere. Hundreds of operations—polishing and grinding dies, burring parts, sharpening cutters, etc.—performed in seconds **without tearing down "set-ups."** Moto-Tool is sturdily constructed for continuous duty. Weighs only 13 oz.—approx. 27,000 r.p.m.—dynamically balanced for vibrationless operation.

MOTO-TOOL KIT NO. 2, with 23 accessories (high-speed steel cutters), and Model 2 Moto-Tool in natural finish hardwood case..... **$23.50**

MOTO-TOOL NO. 2, with one emery wheel point **$16.50**

WRITE FOR INDUSTRIAL CATALOG

DREMEL MFG. CO. Dept. 522-C, RACINE, WIS.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

NTDMA's California Exposure

Los Angeles is now the nation's fastest expanding area for manufacturing the special tools and dies needed in the mass-production of defense items. This was the unanimous opinion of trustees of the National Tool and Die Manufacturers Association gathering from all sections of the country at the Ambassador Hotel for meeting February 1 and 2. The association, composed of more than 500 contract tool and die shops, held its first national meetings on the West Coast to honor the establishment last year of a Los Angeles Chapter, known in NTDMA as a "Tooling Center," with the formation of the Southern California Tool and Die Association. The association is now composed of 20 tooling centers and members in many other locations.

"The heavy volume of tooling orders being placed by West Coast defense industries for jet aircraft, guided missiles and electronics instruments has resulted in contract tool and die expansion here at a rate unmatched by even the large tooling centers of Detroit, Chicago, Cleveland and Dayton," said George S. Eaton, executive secretary of the association, whose headquarters are in Cleveland. He added that the contract tool and die industry in all areas of the country, particularly on the West Coast, is being pressed by demands from defense production industries that in order to take care of both military and essential civilian tooling needs, the maximum efforts of the industry will be required. This will necessitate the addition of the most productive machine tools available to make up for the shortage of skilled men.

The meetings discussed ways of relieving the critical shortage of skilled tool and die makers that plagues the industry. It is estimated that the country needs a minimum of from 15,000 to 20,000 additional toolmakers, 2000 in the Los Angeles area alone; a large number when it is considered that the work of one skilled tool and die maker can set into motion the output of as many as 30 mass-production employees. Approximately 8000 hours are needed to train a journeyman toolmaker, and the subject of apprenticeship education occupied an important place in the meeting discussions.

BIGGEST VALUE
IN
TOOL and CUTTER GRINDERS
TODAY!

Will Do
Anything That
Machines
Costing 2 or 3
Times More
Will Do

Distributed
Only Through
Franchise
Dealers

See Your
Authorized
"K-O"
Distributor
Or Write
For
Descriptive
Literature

K. O. LEE CO.
ABERDEEN S D

Another pressing problem that came in for much discussion was the industry's need for high government priorities to obtain machine tools. Without them they cannot expand further nor meet radical changes in tooling being currently imposed by jet aircraft and guided missiles, where heavier and stronger construction is required and far stricter accuracy standards must be met.

The visiting tool and die executives received a detailed picture of the high rate of Los Angeles expansion from two of the area's leading spokesmen: Carl T. Weitzel, partner of Mechanical Specialties and president of the Southern California Tool and Die Association, and James Riddle, vice president of Modern Tooling Company and trustee to NTDMA from the Los Angeles tooling center.

"It is fantastic the number of shops that have sprung up in recent months," said Mr. Weitzel. "There are now upwards of 300 of them in the area, and new plants and facilities are being added as rapidly as men and machines can be found."

Sales in the last year have doubled, according to Mr. Riddle. A backlog of three months orders prevailed, unprecedented in tooling where the time between design completion and the start of mass-production must be short. Second shifts are being added wherever the skilled men can be found. Mr. Riddle said that his plant is working 58 hours a week on one shift. A fair percentage of the tool and die volume pouring out of Southern California defense industries of necessity is being referred out of the area to the Middle West and East Coast plants, he said.

A growing migration to the West Coast of tool and die workers from Detroit, unemployed by the curtailing of automobile production, was reported by another Los Angeles spokesman, Ralph L. Chrissie, of Hollywood Manufacturing and Supply Company. He said that "1500 good men could get lost out here awful quick."

Other officers of Southern California Tool and Die Association besides Mr. Weitzel are John Gibson, Modern Tooling Company, vice president; Mike Alu, Falco Company, treasurer; and Russ Lamb, Tool-Matic Company, secretary.

MACHINE TOOL SHORTAGE?

. . . Get more production per machine through surface roughness measurement. Fantastic? No! Consider:

- DOUGLAS AIRCRAFT CO. (shown above) boosted production over 50% on a milling operation
- INTERSTATE ENGINEERING CORP. cut honing time on air cylinders by 50%

—simply by measuring microinch roughness in the shop with the Profilometer, and seeing that the parts produced are NO SMOOTHER THAN REQUIRED.

Chances are, *you* can gain machining-capacity the same way—get more production per machine. Investigate!

The Profilometer frees machine-time in other ways too. BULLETIN L-10 tells how. Write today!

Profilometer is a registered trade name.

MICROMETRICAL MANUFACTURING CO.
FORMERLY PHYSICISTS RESEARCH COMPANY
345 S. MAIN ST. ANN ARBOR 15, MICHIGAN

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Titanium, from page 120

As design was improved and problems worked out, two larger units were installed. All three operated around the clock to boost production. Last April the fourth and biggest unit started production and is now being brought up to capacity.

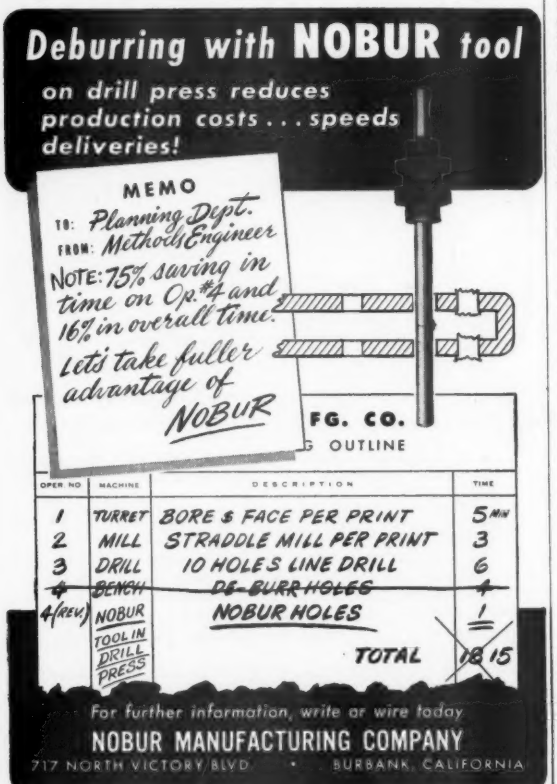
Even when this reaches full capacity next year, it will continue to be used partly for experimental purposes. Research on production requires this. Much of the progress up to now has come from pilot-plant experimentation.

As a major factor in the entire titanium development, Du Pont has pioneered the melting and ingot casting of the metal and has guided the fabricating industry in this key phase. The metal as produced by Du Pont is in the form of sponge. It looks like silvery gray coke. Before it can be fabricated, it must be consolidated. But titanium is such a "getter"—it quickly combines with gases in the air at high temperatures—that casting it into solid metal ingots presented one of those "impossible" appearing problems. Once in ingot form, it can be handled readily.

Research teams overcame the difficulties by designing and building two special furnaces at the Newport plant, for induction and for arc melting of the metal by surrounding it with inert gases. The designs have been offered to titanium customers and at least six of them have been put in operation or are being installed by other companies with the aid of Du Pont's technical service men.

Both furnaces at Newport are large enough to approach commercial proportions. In one of them, more than 15 tons of metal have been melted and ingots up to 650 pounds are now being cast. The mere fact of ingot size is considered of primary importance in the industry and the growth from the first 10-pound ingot — itself a major achievement in the field — has been watched with much interest. Major scientific and engineering problems were posed in the research for methods of producing the larger sizes required by fabricators.

The other furnace, based on arc heating, may hold the key to the continuous melting and casting of titanium—one of the factors necessary to mass production of the metal. In it, ingots can be formed continuously from molten metal, then cut to suitable lengths. Furnaces of this type are now producing ingots as large as 1,200 pounds.


Deburring with NOBUR tool
on drill press reduces production costs . . . speeds deliveries!
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TO: Planning Dept.
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NOTE: 75% saving in time on Op. #4 and 16% in overall time.
Let's take fuller advantage of NOBUR
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1 TURRET BORE & FACE PER PRINT 5 MIN
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717 NORTH VICTORY BLVD • BURBANK, CALIFORNIA

Du Pont continues its research on melting and casting and still does some casting for customers on request. However, the emphasis now is on assisting fabricators to develop their own equipment based on experience and design at the Newport plant.

The company also has done some work on methods of forging, rolling, and otherwise fabricating the metal. This knowledge too was passed along to the fabricators interested in it.

This broad research activity was necessary because there was relatively little knowledge available on the properties of titanium and methods of handling it and using it. More recently, many companies have taken up the work on fabrication and development of uses. Du Pont has stepped out of that part of the picture because it is outside its normal field of activity in chemical manufacturing.

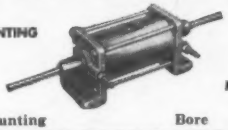
Reduction of titanium ores to metal is chemical in nature and involves chemical operations with which the company is familiar. It also involves raw materials and intermediate compounds which the company has available. Du Pont has a commercial plant in operation for production of titanium tetrachloride.

Research on and production of the metal are a natural outgrowth of the work Du Pont has been doing in the chemistry of titanium for many years. Since 1931, it has produced titanium oxide on an increasing scale. Titanium dioxide is a white pigment which is used widely in paint, enamel, linoleum, paper, and other commonly used things. The continuing research work to improve the pigment led into the scientific investigations which resulted in production of the metal.

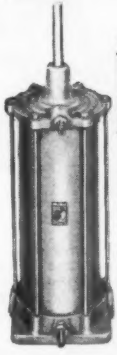
As recently as the outbreak of World War I, titanium in any form had no commercial use worth mentioning. In fact, chemistry textbooks published about the turn of the century contained little information about it. It was considered a rare element. Even today it is among the less familiar elements chemically. However, it has been familiar to the mineralogist as a minor constituent or impurity in a large number of minerals. Vast iron deposits long lay idle because of the contaminating presence of titanium. It was the research aimed at finding a practical method for eliminating this "impurity" from iron ore that led to the discovery of the great importance of titanium dioxide as a pigment.

(Continued on page 182)

DOUBLE-ACTION AIR CYLINDERS



VERTICAL MOUNTING

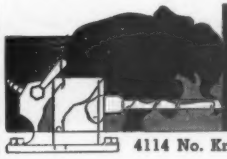


SUSPENDED OR SWIVEL MOUNTING

Mounting	Bore			
Horizontal	1½"	2¼"	3"	4"	5"
Vertical	1½"	2¼"	3"	4"	5"
Face	1½"	2¼"	3"	4"	5"
Swivel	1½"	2¼"	3"	4"	5"

Length of stroke optional

The new Mead Air Power Catalog shows the full line of single and double-acting cylinders, and air-operated Presses, Vises, Chucks, Hammers, Work Feeders—for faster, money-saving production. Write today!



MEAD SPECIALTIES COMPANY

4114 No. Knox Ave., Dept. HA-32, Chicago 41, Ill.

. . . Machinability, from page 61

cutting tool begins to dull immediately when any cutting is performed. However, the drilling speed is kept low and holes may be drilled in the test standard after the test is completed without any appreciable increase in penetration time. Therefore, it is assumed that the relatively slight dulling of the cutting tool has only a negligible effect on the results.

The following describes the drill-press machinability test and explains how the resulting data are applied:

Drill Press Machinability Test

Materials respond differently to each of the various methods of machining. It, therefore, has not been possible to provide any single test which will determine the precise effect of the material being machined on the removal rate, tool like, or on the finishes and tolerances which can be expected from the various combinations of work, tool, and machine conditions.

Moreover, inasmuch as the producers of materials are given reasonable latitude within the Company material specifications on physical and chemical requirements, no single test or group of tests will yield an index which is representative of all the combinations which can be encountered within the specification.

Therefore, practical considerations generally require a compromise with exactness and accuracy for a test which will provide the best guide at a minimum of expense—a guide which will limit the area which must be explored.

Machinability ratings have been based on a number of different tests, such as those of the physical properties of the material, lathe-tool life tests, and tests with various types of cutting tools. The drill-press test has been established as the basis for machinability ratings of materials because this test is readily adaptable to the various shapes and sizes of materials commonly encountered in machine shops. It yields reasonably reliable and reproducible indications of the relative machinability of materials without consuming excessive amounts of time and material.

This test measures the relative resistance of materials to the penetration of a cutting edge. The resistance of a material to cutting, to a great extent determines the heat which will be generated in a cutting edge under a particu-

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Teeth That Tell
It's the "teeth" in Weldon End Mills that tell the story of more production and bigger profits on your jobs.
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lar set of conditions. The heat generated at the cutting edge, in turn has a major influence on tool life.

The drill-penetration test is supplemented by a recording meter which indicates the electrical energy consumed in the operation and from which an index of horsepower requirements for other machining processes may be obtained.

The drill-press test does not provide any means of measuring the abrasive effect of materials on the cutting tools, nor does it produce a guide for interpreting the relative finish which will be obtained when using a particular material or machining method.

Drill Press Machinability Defined

Thus, consistent with this test method, the relative drill-press machinability may be defined as follows:

"The relative machinability of a material is the ratio of the time required for peneration to a unit depth in AISI B1112 cold-drawn steel to the time required for penetration to the same depth in the material under test."

The following variations in the above definition may be derived or may be obtained directly from the test with modification of the controls imposed.

1—"The relative machinability of a material is the ratio of the depth of penetration in that material in a unit of time to the penetration obtained in AISI B1112 cold-drawn material in the same interval of time."

—"The relative machinability of a material is the ratio of the material removal rate of the material in question to the material removal rate for AISI B1112 cold-drawn steel under the same conditions of test."

Conditions of the Machinability Test

A standard twist drill, ground to standard angles and having controlled web thickness, is used as the cutting tool to determine machinability. It is operated at a constant speed and under constant pressure.

The Drill

Standard test conditions require the use of ⅜" diameter high-speed drill operated at approximately 1000 rpm (about 98 fpm peripheral speed). The drill is machine-

(Continued on page 172)

TRIPLE PURPOSE MACHINE
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ILLINOIS DIE FILING MACHINE
An accurate, smoothly-operating machine that files, saws and stones the most intricate die shapes... eliminates tedious hand operations... reduces costs. It is quality-built for long, trouble-free service ... hardened and ground shafts running in bronze bushings minimize wear. The holding chuck and clamping device provide perfect file alignment.
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MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

Circle postage-free Inform-A-Gram Key Number for your request.

Useful Information on Gear Finishing is presented in a new four-page Michigan Tool folder. Entitled "Gear Finishing—When, Where and How to Use It," the folder describes 11 advantages of the process. The various types of gears, gear materials and gear sizes that can be shaved are given. Line drawings and descriptive material explain how gears are finished by shaving and how accuracy is achieved. Underpass, Modified Underpass and Transverse shaving methods are discussed in detail. Address MICHIGAN TOOL CO., 7171 E. McNichols Rd., Detroit 12, Mich.
Circle Inform-A-Gram No. C1.

Anaconda Free Cutting Brass Rods for screw machine use are described in Publication B-14. This colorfully illustrated, 24-page booklet includes physical constants and properties on 46 free cutting and general purpose rods. Also featured are convenient weight tables and conversion factors, plus a ready-reference chart for balancing material costs against production costs. THE AMERICAN BRASS CO., Dept. T&P, Waterbury 20, Conn., will supply copies.
Circle Inform-A-Gram No. C2.

A 60-Page Maintenance and Construction Manual has been published by Allis-Chalmers for distribution to those concerned with safe and correct work practices in these fields. It contains a description of general standards, general rules for overhead work and excavations, safety rules for millwright and machine repair work, for electrical maintenance, etc. Request Manual 25E7524 from ALLIS-CHALMERS MFG. CO., Health & Safety Dept., 1013 S. 70th St., Milwaukee 1, Wis.
Circle Inform-A-Gram No. C3.

An A-N Stainless Steel Fastening Selector is available from Anti-Corrosive Metal Products Co., Inc. Intended to simplify the task of identifying A-N numbers on Government specifications when they pertain to stainless steel fastenings, this slide chart identifies the type of fastening and also gives sizes and other data concerning each item. Address ANTI-CORROSIVE METAL PRODUCTS CO., INC., P. O. Box 870, Albany, N. Y.
Circle Inform-A-Gram No. C4.

"Instrument Shock Testing Theory and Measurement" is a four-page technical booklet describing the use of the Haines Shock Testing Mechanism. Calculations, operation and instrumentation are fully outlined and oscillograms of a complete range of tests are shown. HAINES DESIGNED PRODUCTS CORP., 117 N. Findlay St., Dayton 3, Ohio.
Circle Inform-A-Gram No. C5.

Proper Care of High Cycle Electric Tools is detailed in The Rotor Tool Company's new "Keep 'Em Working" bulletin, No. 39. Cleverly illustrated comments on maintenance, application and safety apply to all makes of high cycle tools and explain the workings for all makes. Subjects discussed include periodic inspection, lubrication, safety, switches, heating of tools,

etc. THE ROTOR TOOL CO., 17325 Euclid Ave., Cleveland 12, Ohio.
Circle Inform-A-Gram No. C6.

"Multipress for Defense Production" is an informative Denison Engineering Company publication. Divided into two sections, this illustrated booklet covers applications for hydrostatic testing operations and for automatic shell-banding. Write THE DENISON ENGINEERING CO., 1197 Dublin Rd., Columbus 16, Ohio, and ask for Bulletin 141.
Circle Inform-A-Gram No. C7.

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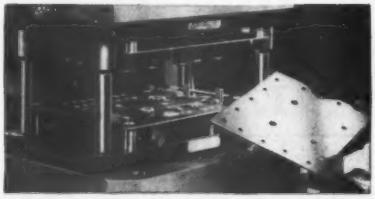
LOW COST methods for PERFORATING and NOTCHING SHEET METALS

Both methods feature: LOW DIE COSTS

All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION** – Down time is minutes as compared to hours for changeover. For precision work in all types and sizes of presses. **START PRODUCTION *at once.*** Pierce up to ¼" thick mild steel. Saving money in the best known plants.

Whistler *MAGNETIC* Dies
t work in large inclinable press. Magnetized units hold the retainers. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



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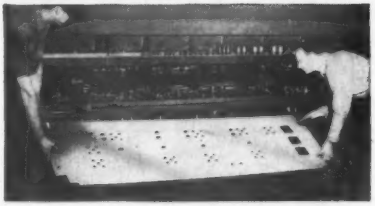

Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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Adjustable, Magnetic, Custom and Cam Dies for all Industry

748 Military Road **Buffalo 23, New York**

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

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64 DRAWER	32 DRAWER	24 DRAWER	16 DRAWER	12 DRAWER	8 DRAWER
$24.95	$12.95	$9.95	$7.95	$6.95	$4.95

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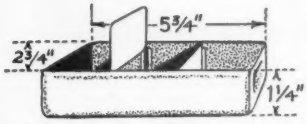

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The AFBDA Bearing Maintenance Report, which was published last year, is again being offered without charge during 1952 to men within industry as a service of the Anti-Friction Bearing Distributors Association and its members. Concentrating solely on the many and varied problems of maintenance of anti-friction bearings, the report is a practical, down-to-earth guide to bearing maintenance problems. Its future issues will offer answers to many problems of bearing service that have rarely, if ever, been covered in any publication. To get your name on the mailing list, write ANTI-FRICTION BEARING DISTRIBUTORS ASSOCIATION, 1900 Euclid Ave., Cleveland 15, Ohio.
Circle Inform-A-Gram No. C8.

The Factors Affecting Tube Life in high-pressure, high-temperature applications are presented in Babcock & Wilcox Company's 40-page Bulletin TR-516. It describes the results of many investigations of carbon steel, intermediate chromium-molybdenum alloy steel and stainless tubing in boilers, cracking stills, heaters and heat exchangers during service at elevated temperatures and pressures in the power, oil and chemical processing fields. BABCOCK & WILCOX CO., Tubular Products Div., Dept. T&P, Beaver Falls, Pa.
Circle Inform-A-Gram No. C9.

A 1952 Directory of electrodes and welding alloys has been issued by Eutectic. This profusely illustrated, 16-page booklet contains data and technical information on a series of Eutectic Low Temperature Welding Alloys for use on cast iron, steel, alloy steels, etc. Two pages are devoted to a chart of over 100 different alloys, their main uses, their bonding temperatures and their tensile strengths. EUTECTIC WELDING ALLOYS CORP., 172nd St. & Northern Blvd., Flushing 58, N. Y.
Circle Inform-A-Gram No. C10.

"How to Produce More Holes with Your Drills" is a "meaty" magazine reprint now available from Oliver Instrument Co. This booklet suggests speeds and feeds for drilling, recommends coolants and cutting compounds, and discusses the importance of sharpening drills periodically. Other subjects that are detailed include advantages of proper drill sharpening, wheels recommended for sharpening of drills, and wet versus dry grinding. Send for a copy to OLIVER INSTRUMENT CO., 1436 E. Maumee, Adrian, Mich.
Circle Inform-A-Gram No. C11.

Improved Packaging Methods that replace the ordinary "tin" can are presented in a 26-page, 8½" x 11", plastic bound booklet, "How Aluminum Can Save Tin," released by Reynolds Metals Co. This booklet is timely because of the need for conserving our meager tin supply. The new packages can be made on standard automatic high-speed packaging equipment readily available. For this booklet, complete with charts and diagrams, address your request to REYNOLDS METALS CO., 2500 S. Third St., Louisville 1, Ky.
Circle Inform-A-Gram No. C12.

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DIE CUSHIONS

15,290 INSTALLATIONS
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For { DEEP DRAWING
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Complete Die Cushion Engineering service at your disposal without obligation on all cushion applications.

DAYTON ROGERS
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2833 13th AVE. S., MINNEAPOLIS 7, MINNESOTA

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Safe equipment, from page 124

also to lift the front rod for releasing rolls when necessary. All hammer motors have across-the-line starters with a drop-cord located at each hammer on which the start-stop, push-button station is mounted. This makes quick stops possible by either hammersmith or heater in case of emergency.

A board cage is mounted on the motor drive to prevent broken boards from falling into the moving belts or down on the hammer crew. A guard rail protects the men when changing boards or making necessary adjustments. Large and small sledges, drifts, etc. are kept available and in good shape at each hammer at all times. Incidentally, we use a twisted handle on all drifts used in driving die keys made from one-half inch round bar stock. This twisted handle has reduced accidents caused by broken handles and heads flying off.

A rivet buster is used to set keys. Each hammer has a magnesium block for use in blocking the ram when making repairs or changing dies. Curved shields made of heavy gauge sheets are hung on the back side of the hammer to protect the hot trimmers and other employees from the danger and discomfort of flying scale, forgings, hot steel slivers, etc. Shields are also available which all crews are instructed to hang on the front side of the hammer when driving out die keys to eliminate the hazard of flying keys.

Natural gas is the only fuel used on our furnaces. As a result we are not confronted with the usual hazards encountered in storing and transporting other types of fuel. All forge furnaces have low pressure gas burners, each unit having separate blowers, gas regulators, zero governors, etc. This set-up enables any unit to be shut down completely in the event of trouble without interfering with the operation of the others.

The shop's gas supply is controlled by a master shut-off valve which is kept clear and marked. This valve will cut off all gas in the entire plant in the event of a fire or other emergency. Pipes from the vents on the service regulators lead to the tops of the flues in the furnaces so that gas will ignite and be easily seen in the event of a failure, thereby eliminating the danger of escaping gas.

All furnaces have guards extending approximately 12 to 14 inches out from the front and also above and below the slot. These guards are lined with insulating

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BOOTH 133
ASTE SHOW,
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ARMSTRONG Lathe Dogs give extra service because they are drop forged from selected open hearth steel, and, are heat treated to extreme toughness and stiffness. Hubs are made large enough to permit re-tapping, screws are also of special analysis steel and are hardened at the point to prevent upsetting.

ARMSTRONG Dogs come in 10 types with square head or safety headless screws, with straight or bent tails. They are carried in stock by your local ARMSTRONG Distributor.

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New York and San Francisco

refractory to keep as much heat off the heaters as possible. On furnaces requiring manual operation the controls are mounted within easy reach of the heater. All forgings are hot-trimmed and presses are of the flywheel type, driven by V-flat belt drives.

All motors are mounted on top of the press. All starters are magnetic across-the-line and are mounted away from the press with start-stop, push-buttons placed on the press within easy reach of the operator. Flywhels are guarded in keeping with the best safety practices. We have one press which is fed by hand and this is equipped with a sweep guard.

Mechanical material handling has presented hazards not anticipated a few years ago. All material handling, from the raw material through the shipping operations, is done in containers transported by fork-type lift-trucks. Guard posts, consisting of steel rails imbedded in concrete are placed at all vital points to prevent accidents to men, and damage to buildings and equipment. We had a fatal accident some years ago caused by a lift-truck striking a table.

This resume does not include all the safety measures being taken in our entire plant, but covers essentially the hammer shop. I might add that mechanical handling is utilized wherever possible.

We, at Indiana Forge, strongly believe that our maintenance department is one of the pillars in our safety program. Our plant is generally operated five days a week. Saturdays are used for checking all equipment for loose nuts, rods, wires, pulleys, etc. and for making all necessary repairs and adjustments.

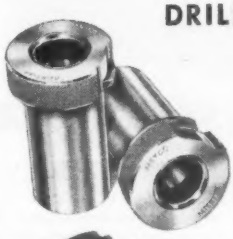
We strive to keep as complete a stock of either new or rebuilt parts on hand as possible to enable permanent replacements to be made instead of just temporary repairs. On Saturdays our machine shop becomes a part of maintenance. Frequently you will find both machinists and millwrights working together on the hammers and presses to put them in top shape for Monday morning. Week-ends are also used for cleanup.

In addition to the maintenance men, top management is in constant touch with the shop. These men are safety conscious and call many existing unsafe practices to our attention.

Our safety committee is composed of our personnel and safety director, forge shop foreman, machine shop foreman, and two

(Continued on page 174)

INCREASE PRODUCTION.. SAVE TIME & MONEY
ON YOUR
DRILLING OPERATIONS



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Carbide Inserted Bushings
last longer, cost less
in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

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Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 17.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Machinability, from page 165

ground and carefully inspected to maintain uniformity. Any variation in the lengths of the cutting edges is restricted to a maximum of 0.005 inch. The primary lip-clearance angle, as measured at the outside corner, is held to 12 degrees, plus or minus one degree. The angle of the lips with the centerline of the drill is maintained at 59 degrees plus or minus one-half degree. The total variation in the web thicknesses of the drills selected for a particular test run is restricted to a maximum of five percent.

Some variation from the above standard conditions is necessary at times to accommodate extreme conditions of hardness or the size of the test specimens available. For example, some stainless steels are drilled at 600 rpm to avoid the possibility of tool failure during test. Small samples may be drilled with ¼-inch diameter or smaller drills and the drilled depths reduced correspondingly.

Machinability Testing Machine

Figure 1 shows a drill press used for machinability testing and Figure 2 is a sketch showing the controls and measuring equipment used with this drill press.

The spindle of this machine is driven by a direct-coupled, Thymotrol-controlled, 1½ hp motor which has infinitely-variable speed over its rated range and is designed to deliver constant horsepower. An electric-feedback tachometer is mounted upon the motor shaft. Due to the fact that the large speed range requires a coarse calibration of this tachometer, finer adjustments and periodic speed measurements are made with a hand-type tachometer as shown in Figure 3.

Both the spindle-head and table are adjustable on the column; however, the spindle operates in a fixed position while the table and work piece are fed up to the drill by means of hydraulic pressure, controlled by a balanced-piston hydraulic control valve. The pressure delivered to the system is regulated roughly by a hydraulic gage, but the net drilling pressure is measured more accurately and adjusted by using a G-E Force Gage, Catalog Number 6987801-G1, placed between the work piece and the drill point. How the pressure is measured and adjusted is shown in Figure 4. The normal test pressure is 240 pounds thrust. This, however, can be modified for certain materials and for

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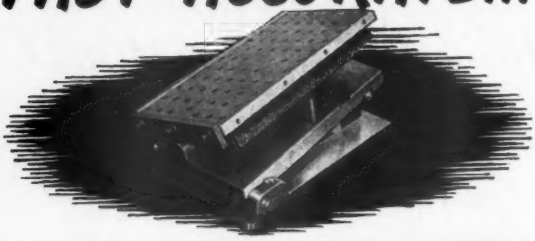

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Now angular inspection set-ups as accurate as the measuring instruments used can be made in a few moments. Any angle, single or compound, is set up by inserting standard gauge blocks between the Sine-Plate plates. Proper size blocks are indicated for all angles in table supplied. Saves hours of set-up time, guarantees accurate inspection. In two sizes; also magnetic models for machining operations.

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tests made with smaller drills.

The time interval is measured by a camshoe and micro-switch contactor which operates an electric timer while the table travels through a specific unit of distance. The timer registers the interval to the nearest tenth of a second. The table height is adjusted for each test so that the measured interval includes only the time during which the full diameter of the drill is engaged. A second contactor shuts off the hydraulic pressure on the system after a fixed over-run of the timed depth, permitting the table to drop to its starting position.

Power Measurements

Power requirements for drilling usually are determined by two methods. The first is through the use of a recording watt meter connected to the terminals of the motor. The approximate wattage used for drilling is computed by subtracting the average no-load watts from the average reading obtained under load. The general power requirements, in horsepower per cubic inches of metal removed per minute may be obtained for any particular material by calculations involving the average net watts used in drilling, the time interval, and the corresponding volume of material removed.

A second, and independent, check on the horsepower used is obtained through the use of an auxiliary table, equipped with strain gages, to measure torque. Calibration of this torque table is illustrated in Figure 5.

Figure 6 is a typical calibration curve. The torque and corresponding rpm reading is converted to a horsepower value which is then compared with the value obtained by the watt meter method. A comparison of the results obtained by measuring the drilling power at the motor and with the torque table is shown in Figure 7.

Drill Press Test Procedure

In addition to the practices and procedures mentioned previously, the following points also are observed in determining machinability ratings:

1. To minimize the influence of slight changes in speed or pressure and other

(Continued on page 217)

HUOT

DRILL DISPENSER

Eliminates Rummaging Through Stacks of Drills

No more running out of drills—your entire stock can be seen at a glance. Each size of drill has its own compartment with rounded bottom for easy selection. You can store dozens of small drills and several large ones in their own compartments. Built-in pricing or inventory system eliminates the need for cost sheets, and will keep a record of drills on hand. Stack two or three cabinets to save space. Specifications: 14½" long, 7¼" high, 7¼" deep. Hammerlin baked enamel finish over rugged steel.

Made in three models for fractional, number or letter drills.

WRITE FOR CIRCULAR

HUOT MANUFACTURING CO.

581 No. Wheeler St., St. Paul W4, Minn.

By the makers of HUOT DRILL INDEX

. . . Safe equipment, from page 171

men picked by management from our employees. This committee holds regular monthly meetings together with safety engineer of our insurance carrier. All accidents of the previous month are reviewed and methods of eliminating similar accidents in the future are discussed.

It is the policy of management to give careful consideration to all suggestions received from the safety committee and if changes are in order, they are made as rapidly as possible. If the suggestions are not practical, the committee tells the men the reasons why. Abbreviated minutes are kept of all safety meetings. These minutes include all problems discussed, suggestions made, including the name of employee suggesting same, reports of previous unsafe practices already corrected, and progress on those not yet completed.

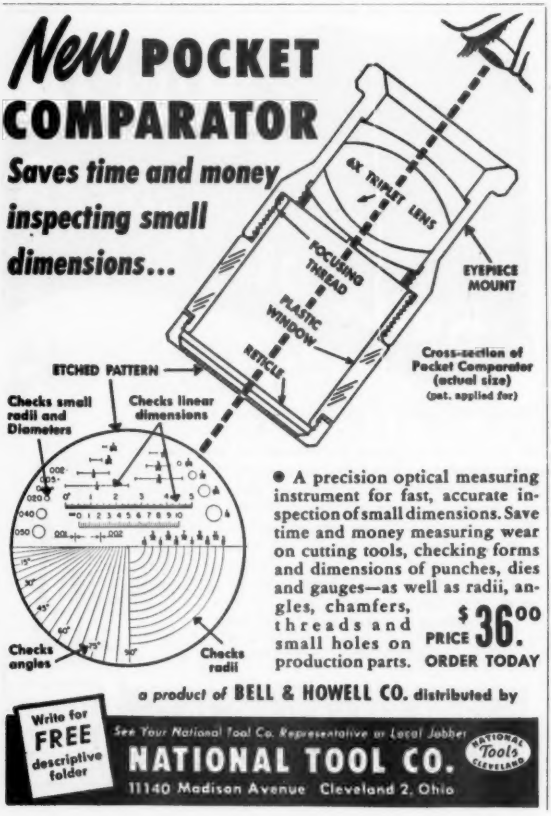
The minutes also designate a specific supervisor whose responsibility it is to attend to each matter which needs correction. As an example: If an unsafe practice exists in a certain department, the foreman in charge of that department is designated to supervise the correction of that practice. If equipment or supplies are needed to further correct the unsafe practice, it is referred to purchasing to procure the needed equipment or supplies.

The minutes are then distributed to top management and department supervisors and are posted on our main bulletin board and on bulletin boards in each locker room. They are also read at our weekly foremen's meeting.

Our insurance carrier supplies copies of their monthly bulletin called the *Safety Supervisor* which is distributed to all members of the safety committee and to the plant manager to help keep them safety conscious.

We also find safety matters and suggestions coming up when management meets with the executive committee of our union and for this we are grateful and encourage them at all times.

I want to, at this time, pay tribute to the safety committee of the Drop Forging Association for the fine job they are doing. I can honestly say that I know of no one thing which gave a bigger boost to our safety efforts than their visit to our plant a few years ago. When this committee with their lettered coats roamed through our shop, the curi-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Saves time and money inspecting small dimensions...
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osity of our men was aroused and certainly made some of our foremen conscious of the junk scattered around in their departments.

My only complaint of this committee is that they, because of their regular jobs, cannot come around often enough. I sincerely hope the Drop Forging Association will employ a full time safety engineer on their staff in the near future to help all member plants with their safety programs.

In conclusion, I believe we have come a long way with safety in our plant but still have a long way to go. We still have the human element and are constantly confronted with plant housekeeping, horseplay, goggles, show-offs, etc.

Our program has not only produced a safer shop, but a more efficient one. In the month of August, 1951, of 3,045 hammer production hours only 166¾ hours were spent on hammer repairs, die repairs and die setting.

★ ★ ★

PEI Schedules 14th Annual Shop Practice Forum

The 14th Annual Shop Practice Forum of the Porcelain Enamel Institute has been scheduled for September 10-12 at the University of Illinois, Urbana, Ill., according to an Institute announcement.

Attended yearly by approximately 300 representatives of porcelain enameling firms and industry suppliers, the PEI Shop Practice Forum consists of reports and discussions regarding latest procelain enameling techniques, and enables an exchange of ideas regarding technical problems and developments with which the industry is concerned. Attendance includes both members and non-members of the porcelain Enamel Institute.

William H. Oldacre Dies; Was Stuart Oil President

William H. Oldacre, president and general manager of D. A. Stuart Oil Co., Ltd., Chicago, died on January 18, 1952. Mr. Oldacre had been associated with the Stuart company for almost 32 years, having been director of research before becoming president.

Mr. Oldacre's previous shop and engineering experience had been with General Electric Company and Timken Roller Bearing Company.

He was active in a large number of engineering and technical societies including the American Society of Mechanical Engineers, Society of Automotive Engineers and American Petroleum Institute. He had also served as president of the National Lubricating Grease Institute.

Drill Hardened Steels without Annealing –

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It— With "HARDSTEEL"

BLACK DRILL COMPANY, Inc.

1368 East 222nd St. • Cleveland 17, Ohio

Also makers of—
BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS
Write for information

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Exhibitors, from page 138

Exhibitor **Booth No.**

The Standard Electrical Tool Co.
Booth No. 1727

On Display: Carbide tool grinders, internal-external precision grinders, grinder heads, vertical spindle grinders, single straight wheel grinders, speed lathes, and buffing and polishing machines.

In Attendance: William Ferguson, Joseph Klopp, Ray Huhn, Pete Wagener, Fred Littlejohn, Frank Jenike, Jack Falls, Robert Dalton, Roger Anderson, Al Danow, Wally Stevenson and Irving Seitz.

Standard Gage Co., Inc.	532
Staples Tool Co.	639
The L. S. Starrett Co.	833
Steel City Testing Machines, Inc.	611

Exhibitor **Booth No.**

Standard Pressed Steel Co.
Booth Nos. 1535, 1543

On Display: Unbrako socket-head cap screws and hollow set screws, pressure plugs and dowel pins; Flexloc locknuts; Hallowell cabinet benches, platform trucks, drawers, tool stands and new knock-down stools.

In Attendance: J. W. Friel, George A. Gade, Raymond N. Gruber, Walter Brown, Thomas Breen, Ford Manhart, Edward Mooney, William Harper, Francis Kinsella, Daniel Hulgrave, Crawford Maxson, Clayton Graham, Bennett Jones, Harold Hafer, Alfred W. Scott and Harry L. Smith.

The Steel Products Engineering Co.
Booth No. 1900

On Display: A Brehm Trimming Die in operation, and samples of flatedge trimmed drawn shells with notches and projections.

In Attendance: Charles Brehm, James Powell, Ora Reynolds and Walter Callison.

CHALLENGE SURFACE PLATE EQUIPMENT

PRECISIONED FOR YOUR PRECISION NEEDS!

ANGLE PLATES Provide a practical and versatile method for clamping and holding work. Challenge plates are made of high grade, fine-grained semi-steel—special heat treated and precision ground to an accuracy of .0005-inch. Made in 22 sizes, from 2½x6x12 inches up to and including 18x18x18 inches.

BOX PARALLELS: Special heat treated and precision ground to an accuracy of .0005-inch.

V-BLOCKS: Recommended for supporting shafts and other cylindrical work when drilling, checking, inspecting, etc. Made of fine-grained semi-steel castings. Special heat treated, precision ground. Ribbed sides.

RIGHT ANGLE IRONS: Made of fine grain special analysis semi-steel, specially treated. End and sides are precision ground both square and parallel.

STRAIGHT EDGES: Scientifically shaped and ribbed to retain accuracy. Made of special analysis semi-steel.

Write for complete information and prices. 684

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN

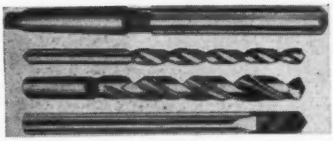
Steelcraft Tool Co.	1102
Sterling Grinding Wheel Div. Cleveland Quarries Co.	1839
Edwin B. Stimpson Co., Inc.	1139
Stokerunit Corp.	508
Stokvis, Edera & Co., Inc.	1028
Stone Machinery Co., Inc.	447
Strong, Carlisle & Hammond Co. Mac It Products Div.	844

D. A. Stuart Oil Co., Ltd.
Booth No. 1823

On Display: Metal parts machined, ground and drawn with Stuart oils. Parts will be representative of all phases of metalworking, including the latest in jet engine components and ordnance items.

Sub-Zero Products Mfg. Div. Deepfreeze Distr. Corp.	337
Sunnen Products Co.	1724
Superdraulic Corp.	849
Sutton Tool Co.	420
Swedish Gage Co. of America	701
SYCOMON c/o Amlintool, Inc.	1030
Taft-Peirce Mfg. Co.	624
The Texas Co.	246
Thomas Flexible Coupling Co. Tocco Div.	451
Ohio Crankshaft Co.	1424
The Tomkins-Johnson Co.	1927
Torit Mfg. Co.	242
Tri-State Machinery Co.	1912
Tubular Rivet & Stud Co.	317
Turner Bros., Inc.	1316
Tuthill Pump Co.	2029
Union Mfg. Co.	1013
Universal Cyclops Corp.	520
Univertical Machine Co.	442
Utica Drop Forge & Tool Corp.	221

Super Tool Co.
Booth No. 1429



On Display: Tipped and solid carbide drills in regular and fast spiral (illustrated), milling cutters, reamers and other cutting tools.

Verson Allsteel Press Co.
Booth No. 2031

On Display: Magnetic sheet separators; projectile forgings and stampings produced by Verson high production presses; pictorial representation of these presses. A Verson press and tool-up for cold extrusion of hydraulic valve lifters will be operated in the Detrex booth, No. 2035.

In Attendance: David C. Verson, John Verson, A. C. Ortmann, Jack Novak, Walter C. Johnson, M. D. Verson, Fred Zapf, Emmet J. O'Connell, H. Allen Pederson, Robert Hoefler, N. J. Kassnel, R. W. Gardner, Jr., H. L. Reynolds, Chris Zeilenga, Paul Kjelstrom, John Powers and Ed Kaster.

(Continued on page 219)

Vanadium-Alloys Steel Co.
Booth No. 536

On Display: Tools made of Vasco Supreme, Neatro and Van Cut, the new high-vanadium "super" high speed steels; cutting tools made of other grades of tool steels; an exhibit of swords representing the outstanding steels of several centuries ago.

In Attendance: R. D. Bardes, T. B. Blackwood, Arthur Brookfield, R. A. Carey, R. Burns George, J. P. Gill, P. H. Heubel, H. G. Johnstin, R. L. Keller, W. G. Lindner, C. A. Lundy, W. R. Mau, J. Cleveland McKenna, J. B. Neff, G. A. Roberts, R. C. Simpson, M. O. Smith and P. L. Swoger.

Tubular Micrometer Co.
Booth No. 707

On Display: Micrometers, calipers, gages, dial indicator tools, precision measuring instruments, etc.

In Attendance: R. L. Johnson, A. R. Mueller, H. M. James and E. A. Yeadicke.

★ ★ ★

J. H. TREDINNICK, former vice president of the Hastings, Mich., Div., has been named executive vice president of E. W. Bliss Co. He will be located in the company's executive offices at Canton, O. Robert Shannon was appointed as new manager of the Hastings Div. at the same time.

Prevent This LOSS with Mall Pneumatic Power Tools

Turn out more work, easier faster, with lightweight, vibrationless tools that reduce fatigue to an absolute maximum. Typical of Mall compactness and precision in pneumatic tools is this No. PG-K1030L Lever Throttle Die Grinder, weighing only ¾ of a pound and easily held in the palm of the hand. With a guaranteed speed of 30,000 rpm. and a maximum of .0015 runout at the collet, this Mall Pneumatic Die Grinder assures accuracy, precision and ease of operation.

Send For Complete Illustrated Bulletin With Price List.

40 Factory-Owned Warehouses, Coast To Coast, To Serve Our Customers.

MALL TOOL COMPANY
7712 S. Chicago Ave. • Chicago 19, Illinois
A 7073-1/9

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Die Duplicating, from page 132

depends upon the particular nature of the mold or die to be produced. If it has a relatively simple shape, and is composed of smooth, flowing lines having no sharp corners or projections liable to chip, one can make a stone model. Such a model is very practical and is least expensive of all to make. A model of this type is made of a powder and liquid, mixed together and poured into a mold, or around the original to be reproduced.

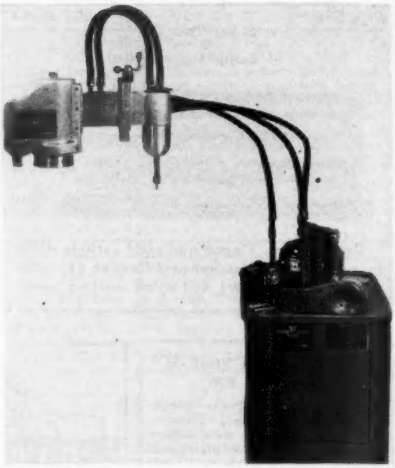
After casting stone-forming materials, they must be allowed to stand for from 12 to 30 hours in order to have a suitable tensile strength. They will not warp, expand or crack, and they hold very accurately to size and detail. Material of this type can be turned, planed, drilled, filed or finished. When fully set, it resembles marble in hardness. Materials for this purpose can be obtained from several sources.

It is usually found best, where one is using a stone composition model from which to reproduce, to use a ground-tooth burr in the machine for doing the metal cutting. Stone models are more liable to chip than other types of material. The fact that burrs of the type mentioned have a number of flutes continuously in contact with the work reduces vibration and chatter sufficiently to make the operation much easier on the stone model being used. Also, such burrs provide an extremely smooth finish on work being processed.

Use of Impression Putty

Some manufacturers of duplicating machines provide a special impression putty which is put up in quarter-pound pieces, and which may be used for taking impressions of dies and molds. This material can be driven into a mold and then pulled out. It retains its shape much better than ordinary modeling clay or plastiline. It is very hard. Before using, it should be softened by keeping it in a warm place or kneading it with the hands. In using it, it should be placed on the end of a hardwood block (or on the end of a dowel in the case of a very small die), and the putty should be driven into the die by striking the wood block with a hammer.

In removing the material from the die, the wood block is pulled away. If care is



The Walker hydraulic duplicating attachment.

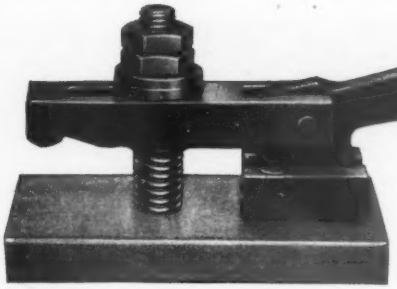
employed, the putty will usually come with the block. Before applying the putty to the die block, however, the die should be moistened slightly with the breath of the operator, or powdered chalk or soapstone can be sprinkled on it. This will prevent the putty from sticking. If the putty cracks, it can be kneaded together after being thoroughly warmed.

There is a Bismuth alloy known as Cerrobase, which melts at 250 degrees F. and has a zero shrinkage. This material has been used to advantage in making proof castings of dies and molds. It can be used for models, but when used "as is," it is really somewhat too soft because it is easily dented by a sharp tracing stylus. On the other hand, it is quite strong, and forms a very good base for a hard spray-gun coating, or for an electroplated coat of hard chromium. If and when sprayed or electroplated with chromium, the material makes an excellent model and is not readily dented by a tracing stylus.

Making Hard Brass Models

Hard brass models for dies can be made up, when necessary, by preliminarily making a sculptor's model of wax or clay, and using it as an original for pouring a stone mold around. The stone mold thus obtained can be employed for casting a

(Continued on page 183)



LODDING CLAMPS and DETAILS

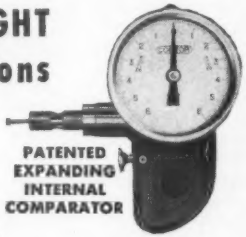
With Lodding Details and Clamp Assemblies real savings begin in the engineering department. You will not only save time from the designing and drawing of special fixtures, but in your tool room expensive labor can be turned to other advantages when Lodding parts are used. Catalog and Tracing Templates, on request.

Lodding, Inc. **Worcester, Mass.**

The internal gage that's RIGHT for war production conditions

COMTORPLUG

Gages precision bores to fractions of .0001"



PATENTED EXPANDING INTERNAL COMPARATOR

⅛" to 8" dia.

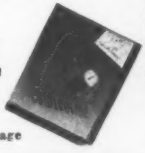
War production conditions intensify the need for a gage that gives high precision yet is Rugged, Automatically Accurate, "Unrestricted".

Patented COMTORPLUG answers the need as no other gage can because:

1) Withstands typical shop use at machine or inspection bench, without lessening precision.
2) Trainees equal old hands in precision results, due to automatic alignment and "feel".
3) For Quality Control, gives actual measurement, and a fixed—not passing—reading.
4) Available anywhere instantly. Weighs but a few ounces. No hose, wire, or "10-ton base".
5) Cost is so reasonable as to be practical for all quantity gaging applications. Fits in with other gaging methods. Let it grow as it proves itself—which it WILL!

Inspection to fractional ten-thousandths of hydramatic airplane propeller distributor valve.

COMTOR CO. *Request "Bulletin 46"*



62 Farwell St., Waltham 64, Mass.

Request data on COMTORGAGE Precision External Gage

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Use free Inform-A-Gram Card for fast service

QUICK-PIC

HYDRO-DYNAMIC PRESSES

Bliss offers a 36-page catalog, No. 30-A, describing and picturing its complete lines of Hydro-Dynamic Presses.

Circle No. E1.

MAGNETS

A complete listing of stocked sizes and shapes of Alnico permanent magnets is included in 20-page, Carboloy Bulletin PM-100.

Circle No. E2.

DRILL UNIT

Delta Hydraulic Drill Units of simple design are presented through schematic drawings, specifications, etc., in an informative 12-pager.

Circle No. E3.

DISINTEGRATOR

Portable Model PX-52 Metal Disintegrator is introduced in a brochure from Warner Div., Clinton Machine Co. It's fully illustrated.

Circle No. E4.

BORING BAR HOLDERS

These holders for turret lathes are fully described in a concise EveredE folder. Prices are listed.

Circle No. E5.

CARBIDE TOOL HOLDERS

Another current EveredE folder covers time-saving carbide tool holders and triangular tool bits. Types for engine and turret lathes are shown.

Circle No. E6.

OIL MIST PRECIPITATOR

Principle of operation, construction features, application, suggested mounting methods, etc., are detailed in Trion Catalog E-50.

Circle No. E7.

GRINDER-MILLER

Folder F1 of Precise Products presents a new Grinder-Miller, the Precise Super 40. Technical data and chief features are included.

Circle No. E8.

BANDMACHINING

A colorful, 16-page publication explains DoALL Contour-Matic bandmachining and illustrates several of its many diverse applications.

Circle No. E9.

OBI PRESSES

Clearing Machine Corp. offers 16-page Bulletin No. 215, which describes in detail its line of geared and non-geared OBI presses.

Circle No. E10.

MAGNETIC CHUCKS

Magna-Lock Chucks, for increasing your machine's productivity, are featured in Hanchett Magna-Lock's latest bulletin, No. 050.

Circle No. E11.

FLEXIBLE SHAFT MACHINES

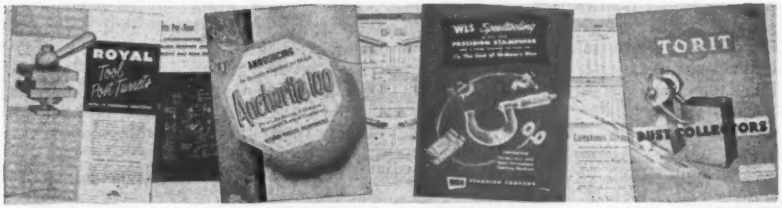
Here's a catalog covering Foredom's efficient machines for every small-work job of grinding and finishing.

Circle No. E12.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

CATALOGS

Use free Inform-A-Gram Card for fast service

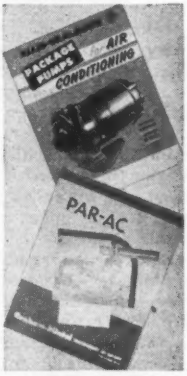


TOOL POST TURRETS
These Royal tools provide 12-position indexing. Royal Products offers Technical Bulletin TP-51 and price lists.
Circle No. E13.

METAL TREATMENT
A new booklet from Octagon Process, Inc., describes Anchorite 100, a paint-anchoring corrosion-resistant phosphate treatment of metals.
Circle No. E14.

SPEEDTOOLING
This method of producing precision stampings with low tool charges is detailed in a four-page bulletin from WLS Stamping Co.
Circle No. E15.

DUST COLLECTORS
Both cabinet and cyclone type collectors are included in Torit's latest, 24-page catalog. Blueprint sketches give over-all dimensions.
Circle No. E16.



PACKAGE PUMPS
Allis-Chalmers is mailing Bulletin 52B-7529, covering its package pumps for a wide range of fractional horsepower applications.
Circle No. E17.

CLAMP SUPPORT BLOCKS
Easier, faster setups can be made in tool rooms and machine shops with Podlin Tool's PO-RO blocks, described in a current publication.
Circle No. E19.

UNDERDRIVE PRESSES
Single, double and triple action underdrive presses are featured in Danly's latest, illustrated catalog.
Circle No. E24.

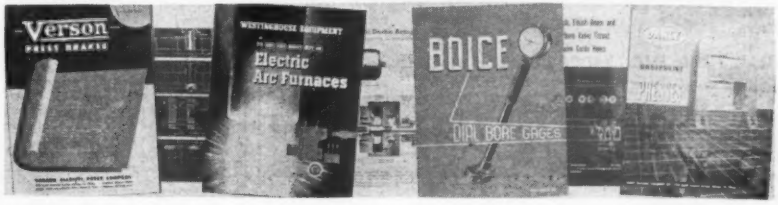
PRESS BRAKES
Design details and specifications of the complete line of Verson press brakes are listed in new, fully-illustrated Catalog B-51.
Circle No. E21.

ELECTRONIC PRODUCTION GAGE
Bulletin 103 from Graham-Mintel fully describes the new "PAR-AC." Outstanding features are pictured and specifications are given.
Circle No. E18.

BROACHES
Kase Machine is distributing illustrated Bulletin 13 on Glenny Adjustable Push Broaches for precision keyways. Current prices are listed.
Circle No. E20.

EQUIPMENT FOR ARC FURNACES
Application of electric equipment to arc furnaces is discussed in Westinghouse's 20-page Booklet B-4695.
Circle No. E22.

DIAL BORE GAGES
These precision instruments, designed to measure internal diameters, are the subject of Boice Mfg. Company's Bulletin No. 51.
Circle No. E23.



SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Titanium, from page 163

Titanium is a low-density, silver-white metal, between silver metal and stainless steel in color. In ductile form, as put out by Du Pont, it possesses an excellent strength-weight ratio and exceptional corrosion resistance.

This means that in comparison to such common metals and alloys as iron, copper, silver, steel, and brass it is relatively light and that for any given purpose it takes less of titanium than of any of the other commonly used metals to get the same strength. It is readily workable and relatively pliable. Its resistance to corrosion by salt water and atmosphere is much better than that of other commonly used metals and it withstands the effects of most chemicals better than most other structural metals.

Reports and studies up to now indicate that titanium metal will find use in the following fields.

1. Aircraft power plants: Its light weight and strength are needed here and temperatures of operation are reaching higher than aluminum alloys can withstand.

2. Air frames: As speeds increase, air frames must be stronger and operate at higher temperatures. Titanium fits these requirements.

3. Pyrotechnics: Titanium powder burns in air with intense heat. This will probably be a small market.

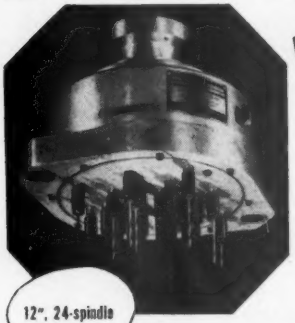
4. Low titanium alloys: A number of iron and nonferrous alloys use titanium in perecentages from 0.1 to 3.5 per cent. The use of high purity metal in these alloys enables producers to get cleaner and stronger alloys with greater regularity.

5. Marine: The unusually fine corrosion resistance of titanium to sea water suggests its use in marine equipment.

6. Chemical equipment: Here again, its corrosion resistance — particularly to oxidizing, chlorine, and chloride reagents — brings it into consideration for chemical equipment.

7. Ordnance: Reports have been published that unalloyed titanium is more resistant to projectiles than any armor plate now in existence. If this is substantiated, the metal will be important in this field.

RAISE YOUR HOLE QUOTIENT



WITH A STANDARD Zagar GEARLESS DRILLHEAD...

12", 24-spindle drillhead; capacity to ⅝" in steel.

drills any number of holes in any pattern

Drill a maximum number of holes in one pass—in any material. Holes can be as close as twice drill diameter. Zagar gearless drillheads are built as a complete unit or may be adapted to any standard drill press. Send us your part drawing and we will submit our quotation.

Write for Manual T-3.

ZAGAR TOOL, INC., 24000 Lakeland Blvd., Cleveland 23, O.

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

THE TIMKEN ROLLER BEARING COMPANY, **Canton, Ohio, has announced the promotion of George J. Muntean to the position of assistant superintendent of the Canton Bearing Factory. Mr. Muntean has been with the Timken company since 1933.**

. . . Die Duplication, from page 178

hard alloy of brass. Ordinary brass castings are too soft, but when properly alloyed, brass can be made extremely hard and will withstand pressure of the smallest tracing point without denting or breaking off. Hard-alloy brass models are highly favored for production of very delicate die and mold designs.

Either plastics or hardwood can be employed as templates or models in die duplication work. In some instances, a manufacturer has plastic molding equipment, in which case it is often found practicable to mold a plastic model from a steel die for use on the duplicating machine. In other cases, an actual molded piece may be employed, and mounted with screws to a plate for attaching to the duplicator master table. Again, skilled men are sometimes able to carve a suitable model from a plastic material. There are plastic materials which are particularly suitable for carving such models.

Plastics of the general type in mind are obtainable in blocks, sheets, and also in rods. They can readily be sawed, drilled, planed, carved and polished. Hardwood can be used in an emergency, but the plastic materials mentioned are better. In cases where it is desired to use hardwood, it is much better to cut or carve the working surface on the end grain of the wood, since end grain has much greater resistance to denting or deformation.

(To be continued)

★ ★ ★

LATROBE ELECTRIC STEEL COMPANY, Latrobe, Pa., producer of high speed steels and tool and die steels, has recently made several changes in their sales setup.

It has announced the opening of a branch office at 5475 Delmar Boulevard, St. Louis 12, Missouri. Under the direction of Mr. Sundstrom, district manager, this office will service tool and die steel users in the area comprising Missouri, Kansas, Oklahoma, Arkansas and southern Illinois.

The Korhumel Steel and Aluminum Company, 3225 Como Avenue, S. E., Minneapolis 14, Minnesota, has been named exclusive Latrobe representative in Minnesota, North Dakota, South Dakota, Nebraska, western Wisconsin, and northern and western Iowa.

Another Latrobe announcement concerns the advancement of C. W. Barnthouse from district manager to western sales manager of the company. This move, intended to coordinate the company's western sales activities, will give Mr. Barnthouse supervision of sales in the 11 Pacific Coast and Mountain states. His office will continue to be located at 3537 East Olympic Boulevard, Los Angeles, California.

SAVE TIME AND MATERIALS

Oil-hardened tool steel tapered pin gages accurate to + 0.0001" − 0.0000" insure dependable sizing and location of holes and slots for machinists, set-up men, tool and die men, inspectors, all who need precise hole measurement.

CONCENTRIC TAPER on lower half of each gage fits holes 0.0012" smaller than standard letter, fraction, and number size drill holes. Makes insertion easier. Permits gaging of odd-size holes and slots.

ALL GAGES are 1½ inches long. Sets contain a pair of each size in a plastic case with 4-place decimal equivalents of each size plainly marked.

ALL ITEMS STOCKED FOR IMMEDIATE DELIVERY

THE Horberg GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

Quantity

Letter sets @ $45. 52 gages (A-Z)
Fraction Sets @ $50. 60 gages (1/64" to 1/2" in 1/64" steps)
Number Sets @ $90. 120 gages (1 to 60)
Single gages @ $ 1.
Stand alone @ $10.

Please Rush checked items and literature to

company
address
name
title

More Scrap Needed to Maintain Steel Production

In a recent letter to industrial executives, which is excerpted below, Director of Defense Mobilization Charles E. Wilson has urged redoubled efforts to salvage scrap:

"A national emergency faces the country right now — Five open hearth steel furnaces already closed down . . .

". . . lack of scrap possibly can shut down 5 to 10% of steel production—the equivalent of 50 to 100 open hearths.

"This would necessitate drastic steel cut-backs all along the line for non-defense industries.

"Get in the scrap now—by intensifying the . . . program . . . by doing this:

"Alert your Scrap Mobilization Committee to this urgent need—

"Re-examine your plant for every particle of scrap—

"Use this slogan—If in Doubt—Scrap It Now—*get that scrap to your dealer today!*"

In conjunction with Government efforts to obtain scrap, the Steel Industry Scrap Mobilization Committee has compiled a "Recommended Procedure for a Dormant Scrap Salvage Program." It follows:

1. Appoint an executive with authority to survey your shop and designate items to be scrapped.

2. Conduct an emergency inspection and inventory of all heavy machines, equipment, boxes, plates, obsolete machinery, tools, jigs, dies, fixtures and items that are broken, dismantled, worn beyond repair, abandoned or in need of parts that can no longer be obtained.

3. Divide your inventory list into these three categories:

(a) Material which can be immediately scrapped.

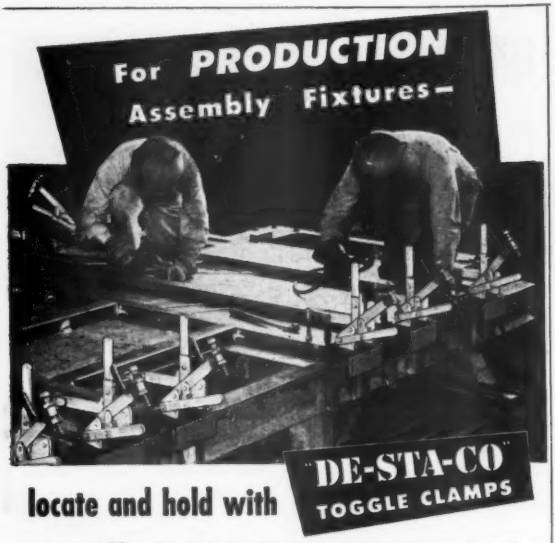
(b) Material which must be kept for repairs and maintenance for near future operations.

(c) Material of questionable need.

4. Establish definite deadline for breaking down the questionable items into those which should be scrapped and those which should be retained.

5. Dispose of all your dormant scrap *at once.*

6. Authorize continuation of this procedure on a monthly basis. Make it the responsibility of the official in charge to keep the program rolling by making a scrap survey and cleaning out dormant scrap every 30 days.



locate and hold with "DE-STA-CO" TOGGLE CLAMPS

High holding pressures and precision construction of "De-Sta-Co" Toggle Clamps make this assembly fixture efficient. Locating pins welded to clamp bars *locate* channels for welding assemblies of varying lengths. Positive holding pressures, up to 4000 pounds in some models, hold parts in close contact essential for good production welding. *The same principles apply* to your drilling, machining, bonding, gluing or other production processes. Quick toggle action permits fast, safe loading and unloading of fixtures, uniform results, even by untrained workers.

Your nearby "De-Sta-Co" Distributor stocks more than 40 models for your convenience. Write for his name and your copy of new catalog issue.

DE-STA-CO DETROIT STAMPING COMPANY

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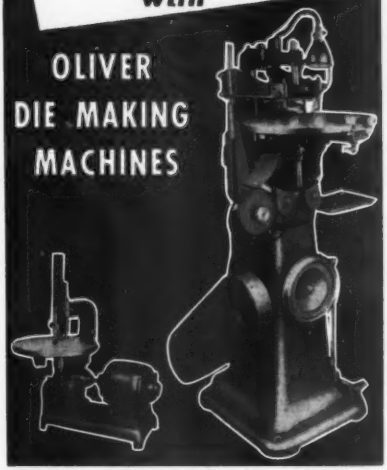
SEE OUR EXHIBIT IN BOOTH 115, ASTE SHOW, MARCH 17-21

More Accuracy More Speed Greater Production *with*

OLIVER DIE MAKING MACHINES



You don't have to experiment or look afar to find the proper machines for faster and more accurate die making. For almost four decades, the OLIVER Method of making dies by sawing metal with a jig saw and filing by machine methods has proven its efficiency in thousands of plants. As a matter of fact, many OLIVER Die Making Machines have been in continuous use for more than 25 years—proof of their efficiency, speed and accuracy. With OLIVER Die Making Machines skilled labor is not required for sawing, filing and lapping operations. Savings in time and costs are effected up to 60%. Find out for yourself . . . BE WISE, OLIVERize.

OLIVER DIE MAKERS Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

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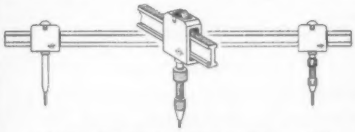
1436 E. MAUMEE - ADRIAN, MICHIGAN

Famous ERA BEAM COMPASS



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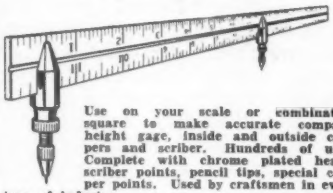
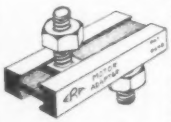


Use on your scale or combination square to make accurate compass, height gage, inside and outside calipers and scriber. Hundreds of uses. Complete with chrome plated heads, scriber points, pencil tips, special caliper points. Used by craftsmen in every type of industry.

MOTOR ADAPTOR PLATES



Motor Adaptor plates permit the interchangeability of various sizes of motors without serious loss of time or production. They fit any base - no drilling or filing. No holes out of line and no rotor shaft too long or too short. The motor can be shifted forward or backward to obtain the proper belt adjustment and right or left for exact pulley alignment. 3 Tolerances permit use of longer or shorter ruler shafts and longer or shorter belts.

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ENGINEERING RESEARCH ASSOCIATES, INC.
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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

VPI Chemical Eliminates Rusting of Steel Micro Specimens

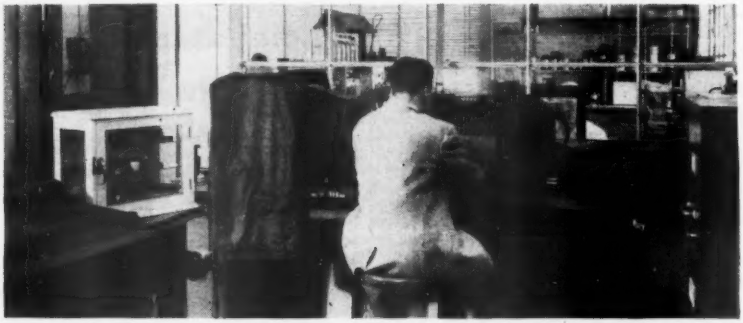
These two micro specimens were photographed without repolishing and etching, after having been in the cabinet containing VPI crystals for about three months. They are up to standard for microscopic study without further attention.

Microscopic study of steel specimens for machinability rating and heat treating procedures is a continuing function in most metal working companies, involving both production and control laboratories. Corrosion of micro-specimens has proved to be a problem with many companies, entailing considerable time and cost in the repolishing and etching of such specimens.

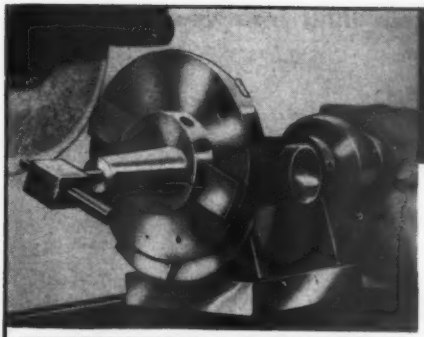
Jones & Lamson Machine Company of Springfield, Vermont, manufacturers of precision machine tools and optical comparators, recently came up with an answer to this problem of micro-specimen staining in connection with its laboratory procedure of controlling incoming steel alloys for machinability and structure. Simply enough, Jones & Lamson metallurgists have been able to prevent this condition by placing 2 grams of VPI, a volatile chemical obtained from the Shell Oil Company, into the cabinet containing the specimens.

Since first using this chemical last October the lab has been able to eliminate the repolishing and etching time previously required to bring specimens up to standard for microscopic study. Specimens were formerly protected in a grease seal dessicator containing an obsorbent. In spite of this it was noted that stain sometimes appeared on the specimens within one or two days. Since using the new chemical, specimens have been protected from rusting for as long as three

(Continued on page 190)



Section of the Jones & Lamson laboratory devoted to the study of micro specimens representing incoming steel alloy stock for machinability rating and heat treating structure. Cabinet containing representative specimens is shown at the left.



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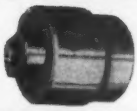

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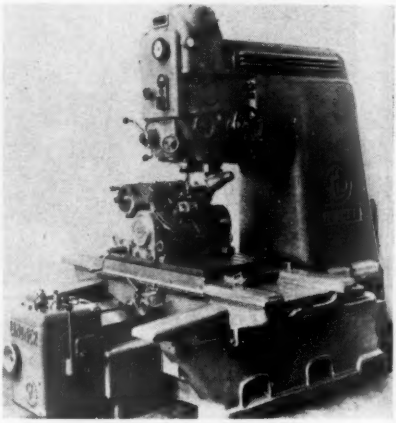
Optical Measuring System Built into New Jig Borer

Table settings accurate to plus or minus .00032" with maximum error between two bore holes held within plus or minus .0004" are provided by a unique direct-reading micro-optical measuring system built into the German-made Lindner jig borer now being distributed in this country for the first time.

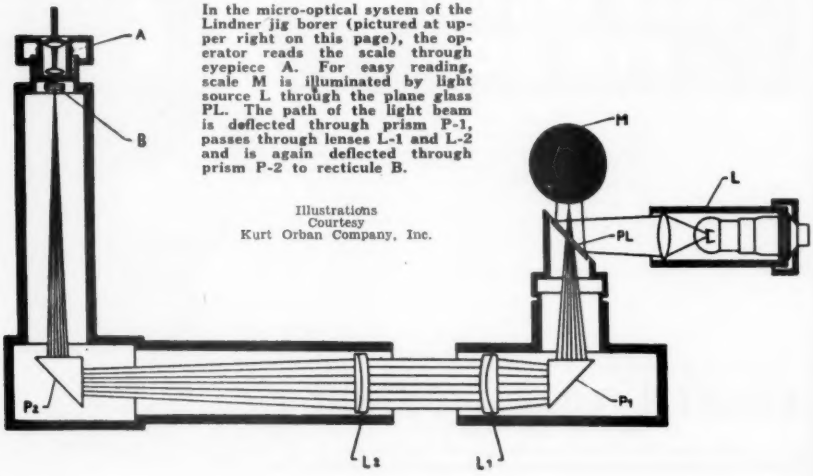
A fine helical line, diamond-inscribed on mirror-finished cylinders, provides the basis for optical reading of the fine adjustments of both longitudinal and transverse movements. Rotatable cylinders, connected to the coordinate slides, enable intermediate measurements from thread to thread to be set on an annular scale to plus or minus .00004" and to read through the microscope. The accuracy of adjustment is maintained throughout the life of the machine, since there can be no mechanical wear on the measuring system.

Single column design and sturdy, open construction make this jig borer equally adaptable to precision boring of bulky workpieces or heavy roughing operations without affecting the machine's accuracy of adjustment.

Infinitely variable spindle speeds from 50 to 1900 rpm are provided in the model pictured. Speeds of 70 to 2000 rpm are provided in a smaller model.



The larger model has a table movement of 40" (longitudinal) by 24" (transverse). Distance between table surface and boring spindle is 10" minimum and 30" maximum; in special designs, maximum distance can be increased to 34" or 38". Corresponding dimensions for the smaller model are as follows: table movement 24" by 16"; distance between table surface and boring spindle 3.2"—21.6".



In the micro-optical system of the Lindner jig borer (pictured at upper right on this page), the operator reads the scale through eyepiece A. For easy reading, scale M is illuminated by light source L through the plane glass PL. The path of the light beam is deflected through prism P-1, passes through lenses L-1 and L-2 and is again deflected through prism P-2 to recticule B.

Illustrations
Courtesy
Kurt Orban Company, Inc.

Peaslee

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TOOL AND DIE STEEL HANDBOOK

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Here's the BOOK OF ANSWERS for every man responsible for tools and dies. Shows you how to increase your company's production from present equipment—how to reduce toolmaking trial and error, conserve tool steel, avoid die troubles, simplify heat treatment. Gives complete working information on everything from selection of the right steel to heat treating methods and equipment, hardness and toughness testing, latest data on high speed and hot work steels. 564 pages, 355 charts, photos, diagrams give you facts on: how design affects heat treatment, hardenability tests, time required to heat different tools to required hardening and drawing temperatures, furnace atmospheres, quenching, tempering, trouble-shooting.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Rusting, from page 186

months, despite the fact that the specimen cabinet door has been left open from 5 to 10 minutes on many occasions.

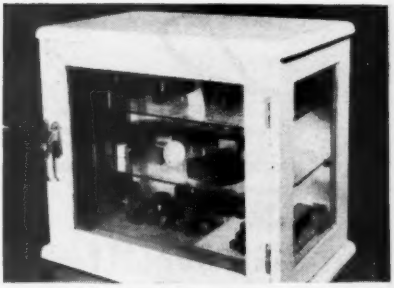
The active substance in VPI is a slightly volatile nitrite salt, dicyclohexlammonium nitrite. In use the vapor from the VPI crystals condenses on the metal surfaces or dissolves in condensing moisture. An important provision, however, is that some barrier must be provided to prevent undue loss of the protective vapor.

Characteristically, VPI is a white crystalline solid that melts at 310F. without decomposing and pH of its water solution is 7. It is practically odorless, moderately soluble in water, very soluble in methyl alcohol, slightly soluble in low molecular weight polar solvents and practically insoluble in hydrocarbons.

Depending on the application, VPI can be introduced as a powder, as in the case of Jones & Lamson's use of it, dissolved in alcohol and sprayed, put into solution for metal dips, or used as a coating on wrapping papers.

It is apparent that VPI's characteristics lend themselves to a number of useful applications in the metalworking industry, and particularly in the tool and die industry. One company is using the chemical for protecting glass molds during storage periods. Another company uses VPI in water solution for protecting steel parts between machining and grinding operations.

Typical of the products being protected against corrosion in shipping are ball bearings, water pumps, industrial filter elements, castings, forgings, precision nuts and bolts and tools and dies. Its ability to protect in the presence of air and moisture is one of its most useful properties, as is its ability to arrest corrosion at any advanced stage.



A small white crucible containing VPI crystals can be seen in the center of the middle shelf. Only .004 of a gram of VPI has been sublimated in the sixth-month period to maintain adequate micro specimen protection.

Jones & Lamson metallurgists point out that only a very small quantity of VPI need be used to perform a fully preventive function. The product is not a cure-all, of course, but it is proving to be a convenient and economic method of preventing and arresting corrosion of steel parts and eliminates substantial man hours previously assigned to rust prevention and subsequent removal of the protective medium.

Ryerson Idea Releases New Steel as Well as Scrap

An aggressive plan designed to get stagnant steel and idle equipment into use, or moved to the steel mills as scrap, has just been announced by Joseph T. Ryerson & Son, Inc., one of the nation's largest steel distributors. Steel users are being urged to check their inventories of steel that isn't being used or marked for use; their idle and discarded metalworking machinery and allied equipment; and then decide if they should be sold, kept or scrapped.

To help steel users dispose of items they are willing to sell, Ryerson is offering to publish without charge classified advertisements in its big pictorial-type newspaper, which is circulated nationally to more than 100,000 firms in all lines of business. In its letter to customers explaining the plan and offering to run free advertisements, Ryerson points out that the program is designed as an exchange between steel users, making usable steel and equipment that may be lying dormant available to someone else who can use it.

It is recognized that production scrap moves promptly to the steel mills without delay or prodding. The Ryerson plan approaches the problem from another angle and is aimed primarily at prying loose unused steel and equipment and getting it into use, or if it is found unsuitable, getting it scrapped.

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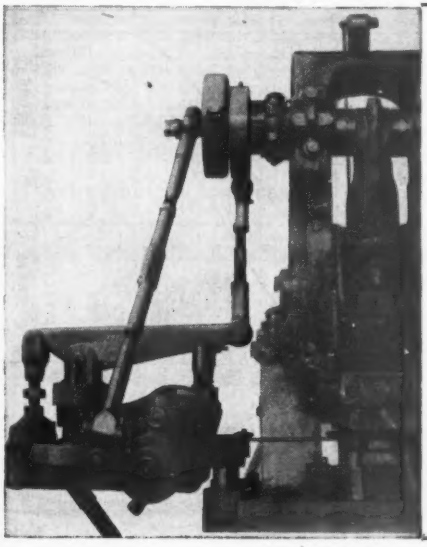

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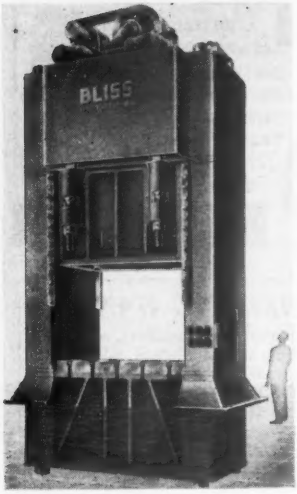
Toggle Presses Permit Higher Production Rates



Illustrations courtesy E. W. Bliss Company

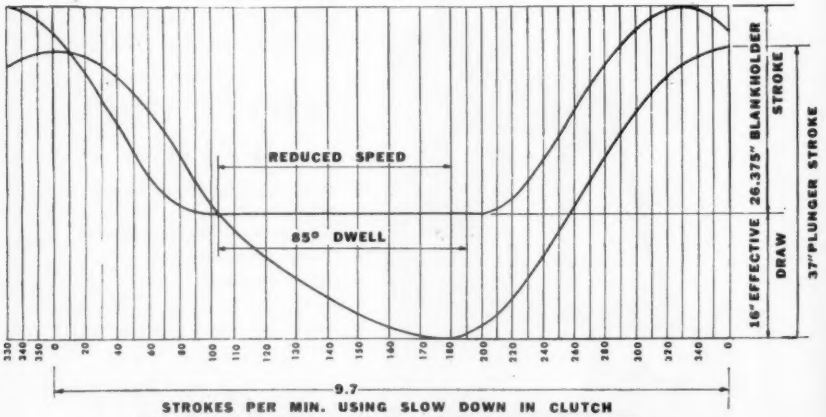
A new series of four-point, double-action, toggle-drawing presses featuring quick advance and return speeds and extreme accessibility for maintenance purposes, has been developed. The new presses are specially designed to meet the needs of the automotive and allied industries by making possible higher production rates for large-area, drawn stampings.

Greater production rates have been made possible through use of the Eddy Current Drive Clutch, which provides for quick approach to the work, slow-down to give proper drawing speeds, and quick return speed to the top of stroke. Even with comparatively slow drawing speeds, a rapid press cycle is possible. The slow-down is accomplished by controlled slippage of the Eddy Current Drive Clutch through limit switches that can be adjusted to vary the speed of any portion of the draw cycle.

There are three substantial cross-members in the crown, which contains four totally enclosed gears with integral eccentrics for operating the plunger slide. Crown sections beneath the gears form a rigid tie member for the front, center and back transvertical sections. All gearing and toggle bearings inside the crown are lubricated by a cascade oil system.

Each main rockershaft is in one piece and is easily removed from the top of the crown by unshrinking the rockershaft bearing cap tie-rods with Calrod units.

MOTION DIAGRAM FOR BLISS D-4 PRESS



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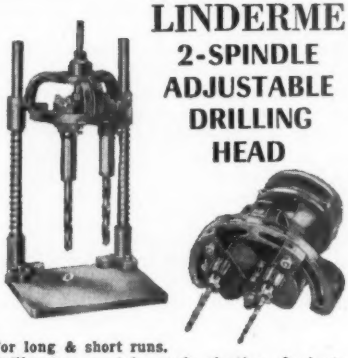

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FINGER STOPS
IN 3 SIZES

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Measuring Surface Finish and Roundness of Spheres and Cylinders in Millionths

How do you go about measuring the smoothness or roughness of a highly polished steel sphere or cylinder? How can you tell whether a machined steel circle is a perfect circle or not? Some time ago The Timken Roller Bearing Company developed a machine which could determine with extreme accuracy, just how rough or how smooth a steel surface was. Just recently, Timken Company engineers have added a further refinement to this machine. With this new development, it is possible to determine if a ground circle is perfect or not. (With this new development, both surface finishes and geometry are checked within a millionth of an inch.)

Since we are accustomed to hearing such astronomical figures as billions, when we speak of the national debt, perhaps one millionth of an inch doesn't seem too impressive. What that figure means can be dramatized when you realize that one millionth of an inch is forty-six thousand times finer than the thickness of a thin dime. A millionth of an inch is 3000 times thinner than a single sheet of newspaper.

The name of this phenomenal machine that can measure accurately to within a millionth of an inch is the Profilograph. This development was directed by the Experimental Engineer for The Timken Roller Bearing Company. Roughly, it works as follows: The surface of the object to be measured is mounted on a flat, delicately adjusted table which is fitted into a special bearing. A highly refined hinge is mounted just above the specimen for measurement. At the end of this hinge is a diamond needle and a tiny mirror. The diamond needle traces ever so lightly over the surface of the object as the complete table upon which the specimen is mounted turns. As the needle rides over the surface, any variations in that surface wiggles the needle, and also the tiny mirror mounted on the same hinge as the needle. A tiny beam of light is played on the mirror and as the mirror moves, the beam of light moves also. Through a series of other mirrors, the light beam is transmitted onto a photographic film and the variations on the surface of the object being measured are recorded on a circular film. It is this instrument that can tell the initiated just how rough or how nearly perfect are Timken tapered roller bearings. By changing the length of the light beam, surface variations can be magnified up to 5000 times their actual size.

The Profilograph is designed to measure accurately, to within a millionth of an inch, the surface finish and roundness of spheres and cylinders. A diamond needle and tiny mirror are mounted on a highly refined hinge and as the needle traces lightly over the surface to be measured, any wiggle of the needle imparts a movement to the mirror. As the mirror moves, a tiny beam of light is played on it and through a series of mirrors, the beam of light is transmitted onto a photographic film. The variations on the surface of the object are thus recorded on a circular film.

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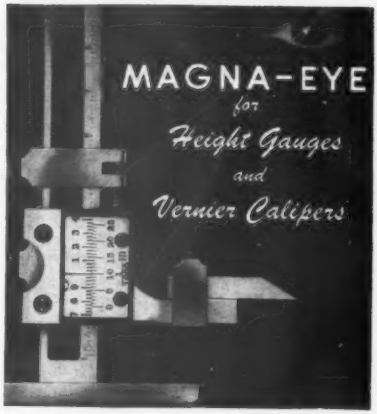

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. . . for Accurate, Effortless Reading of Vernier Scales on Height Gauges and Calipers.

The New Improved MAGNA EYE is a highly perfected precision instrument. It permits the user to view the hard-to-read vernier scales without eye strain or effort, eliminates errors — no more hit and miss reading; plugging and unplugging eye cups — read the vernier scale with both eyes open in the same position as your book or newspaper. MAGNA EYE is a time saver in any shop turning out high precision work.

Magnifies four times — MAGNA EYE is not an ordinary magnifier — it is optically perfect glass lens especially designed and developed to meet all requirements in reading the vernier scale — is provided with a focus limit stop to meet the individual vision requirements. It is built to last the life of the tool for which it is designed. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many, many others.

Made in three sizes to fit Starrett, Brown & Sharpe, Lufkin and other tools of similar design — S #100 for 6" vernier calipers; S #200 for 10"-12" height gages also 10"-18"-24" vernier calipers; S #300 for most popular type 18"-24" height gages and 36"-48"-60" calipers.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Monochromatic Lights for Measuring in Millionths

The monochromatic light brings to industry a means for quickly checking the dimensional accuracy of finished parts. It provides a large, intense light source from which to check the precision accuracy of gaging instruments as well as parts in production. When used with optical flats, this type of instrument can measure size, flatness and parallelism to within a few millionths of an inch.

The light source provides extremely accurate interference bands at .0000116" intervals. The interference bands appear clear and sharp.

Optical flats come in both round, Figure 1, and square shapes, Figure 2, (B). The square flats have just been introduced for certain applications where round flats are difficult to use, and in some cases, such as checking flatness up to shoulder, impossible.

Inspection of bores and inside diameters for surface defects can be accomplished efficiently and with very little eye strain, thereby reducing worker fatigue.

Photo courtesy Acme Scientific Co.

Fig. 1. A new model monochromatic light designed specifically for making light wave measurements in the shop or laboratory.

Photo courtesy The DoALL Company

Fig. 2. The original model "Monolight" is shown at (A). The new model "Monolight," (B), is a self-contained unit having a 5" x 5½" high-intensity helium light source providing 53-foot candle power on the testing stage.

Figure 1 shows a monochromatic light recently developed by one manufacturer. This new light, with its large, bright working field, avoids the necessity of exact placement of the work, and makes inspection easy and fast. The interference bands can be seen on a relatively dull surface or through an appreciable air gap. These bands appear only light and dark, and do not show in confusing rainbow colors as they do when ordinary white light is employed.

The late model "Monolight" pictured at (A), Figure 2, has as a standard stage a 6⅛" x 4⅛" phenolic plate. This plate can be substituted by a granite surface plate lapped to within one wave band of true flatness. Under the hinged work stage there is sufficient storage space for six 2" optical flats and three each 3" or 4" flats. To inspect large areas or greater work heights, the head, or light source, can be turned 180 degrees, giving the operator a large free working area.

Both new units are lightweight and easily portable. Each comes with extension cord for operation on 110-120 volt, 60 cycle alternating current.

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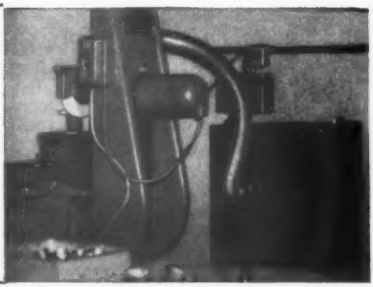

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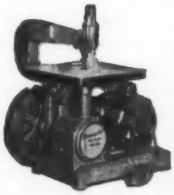

DIE FILER

Model FS shown performs all die making operations. Equipment includes File Roller Support Overarm in addition to overarm shown.

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SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

Recording Voltmeter Checks Quality of Automatic Welds

On some of the wash pipes manufactured by The National Supply Co. for their Ideal Swivels, a machined steel ring is welded to the tubular body at one end to form a shoulder. The welding is done by the submerged-arc method on an automatic machine, and, as the name implies, the arc and bead are hidden from the operator during application. Thus, he cannot check the work or make adjustments for erratic behavior while the weld is being made. To be on the safe side, we had been in the habit of laying two beads, one over the other, to get a high-quality leakproof joint.

by **George A. Hatfield**
Production Superintendent
The National Supply Co.
Torrance, California

Even with this practice we had no definite assurance of a quality weld, or evidence when the machine was operating erractically until the part was tested and inspected. What we wanted and needed was some means of indication that we could interpret in terms of either harmful or merely incidental departures from normal.

Fig. 1. Machine operator checking one of the automatic welders equipped with a strip-chart voltmeter used to measure voltage variation across the arc.

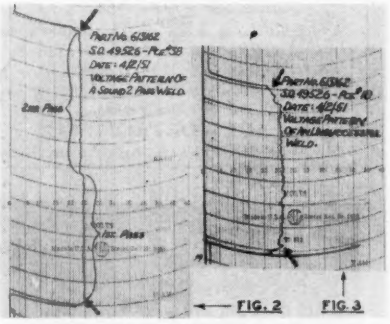

Fig. 2. Chart line within the two arrows shows the voltage pattern of the arch during a sound two-pass weld.

Fig. 3. Voltage pattern of an unsuccessful weld caused by lack of root penetration. Result was a one-pass weld instead of two; the bottom of the groove being filled with flux.

After investigating several suggested methods, a joint committee from the weld shop and plant electrical department selected the idea of measuring the voltage variation across the arc as being the best telltale of conditions in the weld. Connected across the electrode and work, the strip-chart recording voltmeter selected has been successfully providing true pictures of the welds that match x-ray tests.

To correlate the pattern on the chart with the welded part, both the part and its chart pattern are numbered, and if the chart curve deviates from normal, the part is forwarded to the laboratory for x-ray. As a means of reducing x-ray examinations to those parts exhibiting flaws that might cause leakage, we are building up an album of records by attaching the voltmeter chart to its corresponding x-ray film together with a statement of facts bearing on the case.

As the album library grows, we will be able to identify variations on the voltmeter chart with the type of operating incident and effect on the product to minimize the number of x-rays needed.

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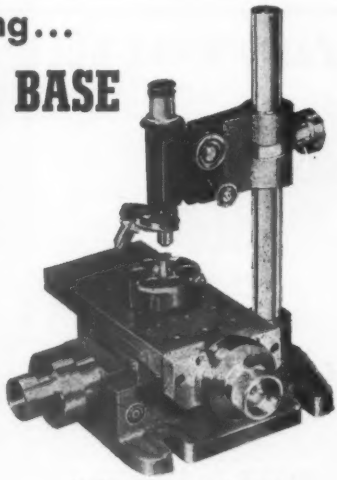

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Handling Turret Lathe Work on a Small Lathe

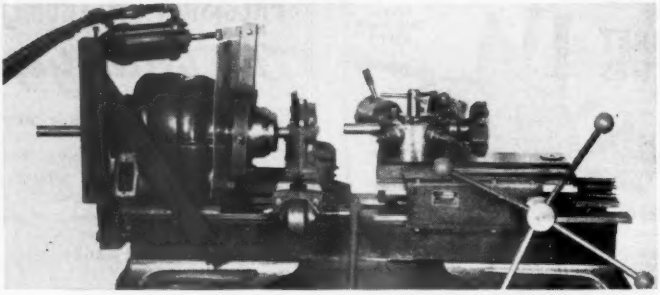

Photo courtesy A. A. Tool Company

Turret lathe or screw machine work can be handled on a small lathe equipped with a self-indexing precision bed turret, such as the one shown above. All production operations, plus many operations done with the regular tailstock, can be accurately performed.

The pilot wheel-operated bed turret, illustrated, accommodates six tool positions in the all-steel head, providing maximum tooling for the lathe. Accurate adjustment for every tool position is accomplished by stop screws that index with the head.

Ground bearing surfaces on the slide and bed provide definite stroke accuracy, which is maintained for the life of the turret by adjustable gibs on both sides of the bed. Rigidity and balance for precision operation are provided by the broad base.

Extra rigidity is gained by a manual head-lock which locks with a quarter turn of handle.

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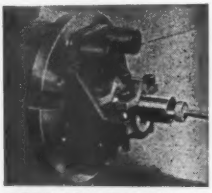

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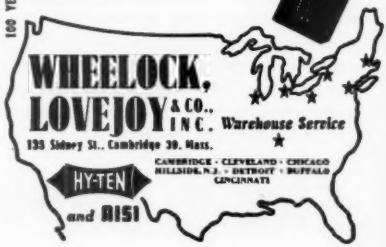
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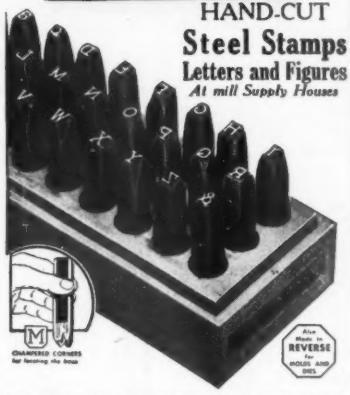

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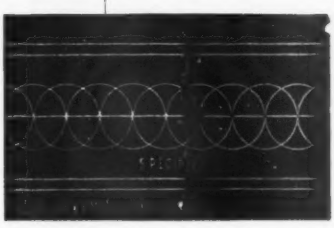

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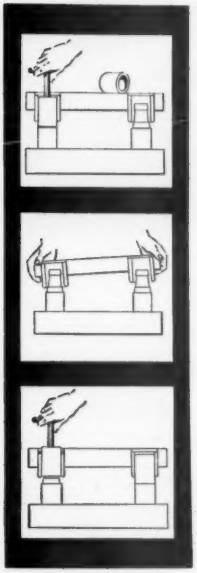
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

New Removable Cap Guide Pins End Punch Holder Binding In Separating Two and Four Post Die Sets

A new type, removable cap guide pin has been designed to eliminate punch holder binding in separating die sets. This advanced die set component quickly ends troublesome locking problems when uneven pressures are exerted in separating the punch from the die holder.

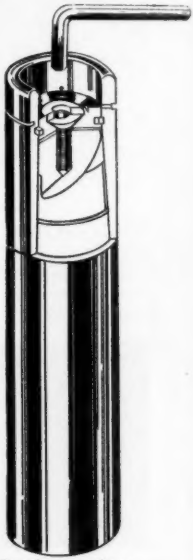
With removable cap guide pins, the punch holder is readily freed on the uppermost part of the pins where it is most apt to tilt and bind. Removing the detachable caps allows greater freedom of movement at this critical point, speeding over-all assembly operations. Instead of three or four men using time-consuming pry bar methods to separate a large punch from a die set, one man, by removing the guide pin caps, can part the die set alone with minimum effort in a few minutes.

The cap is removed from the guide pin by loosening a socket head screw that holds it in place. This screw rotates in a collar and serves as a jack for the cap, thus assuring positive separation from the guide pin proper. When all caps are removed, the punch holder virtually floats on the upper pins when it is raised. Regardless of uneven pressures in lifting the punch holder from the die set, it is impossible to misalign this half to cause binding.



The line drawings in the left-hand illustration indicate the clearance provided by removing the guide pin caps. Top, removing cap; center, parting die set; bottom, replacing die set.

The right-hand illustration is a cutaway view of the new removable cap guide pin showing structural features. The hardened pin is precision made throughout. The body of the pin is ground to plus .0005" minus .0000" to insure maximum matching accuracy of the punch and die and to maintain constant alignment of these parts during in-use service. In addition to the rigid over-all tolerances of the guide pin, a 1½"-ft. taper seat is ground on the upper part of this unit to receive the removable cap. A hole is drilled and tapped in the top of the pin for the socket head jack screw.



Drawings courtesy Superior Steel Products Corporation

A matching 1½"-ft. taper is ground in the removable cap so that the part can be readily assembled to the pin. The cap is locked in position by tightening the jack screw. Then it is ground in place for perfect match with the guide pin body. Unusual care is taken in all grinding operations so that caps can be interchanged with pins of the same size. This is done to eliminate the possibility of lost time in reassembling die sets when components are separated.

An additional feature in the structure of this pin provides for replacement of only the cap when pins wear because of long press runs.

A deep recess is machined into the top of each guide pin cap to form an oil reservoir. Suitable openings are provided through the cap wall to the outer bearing surface. Oil flows through these openings to lubricate the guide pin and guide pin bushing.

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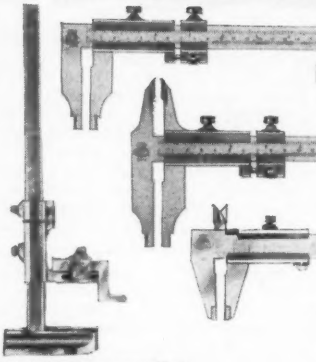

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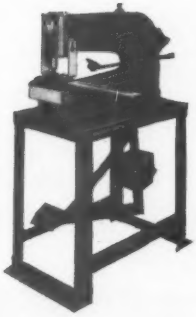

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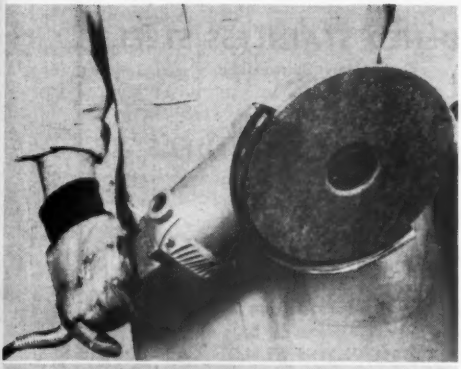

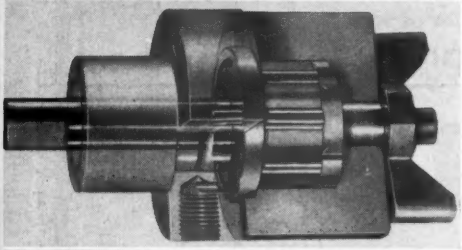

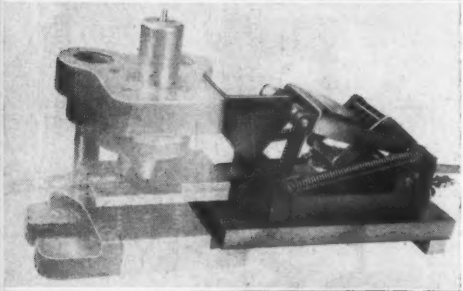

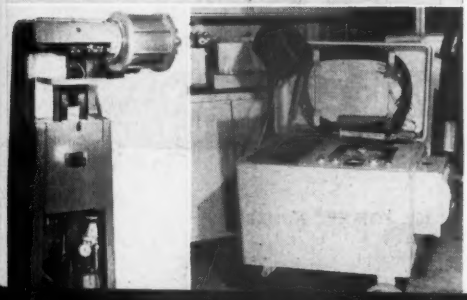

The Norton BFR Wheel is a new reniforced, flexible, hub-type grinding wheel with which an operator can now rough grind, finish grind and notch. Designed for use on "right angle" or "sander" type portable grinders, the metal is made of carded web material impregnated with abrasive grain. Generally, the new BFR wheel will be used to smooth down welds, blend surfaces on contours, and notch risers in all kinds of castings. Address NORTON CO., 1 New Bond St., Worcester 6, Mass.
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The "Magna-Mite" is a new positive displacement pump of compact size. With a capacity of from 1½ gpm down to ¼ gpm or less, it is suitable for handling fuel oil, gasoline, hydraulic fluid, lubricating oils and other light viscosity fluids. A design feature, rolling vanes that minimize friction and increase pump life, is shown in the combination cutaway and phantom view at the left. Write the manufacturer, MILWAUKEE HYDROPOWER, INC., 3447 N. 35th St., Milwaukee, 16, Wis., for details.
Circle Inform-A-Gram No. A2.

The JACO GRIP-O-MATIC Feed is an automatic, hitch type press feed for mounting on the die set or bolster plate. It grips the stock firmly under spring pressure while being fed into the press tool but, at a predetermined point before the die starts to work the material, its gripper releases and the stock is free to float in response to die pilots or metal flow requirements of forming operations. JACO DEVICES, INC., 96 High St., Hingham, Mass.
Circle Inform-A-Gram No. A3.

Matthews No. 204-CR Reciprocating Head Marking Machine (outside cut) can impress an extra-deep mark on tough metal surfaces without exerting extreme pressures and shock to the parts being marked and to the marking dies; or where parts are of such design that they will not withstand the necessary pressure required to make the mark in one pass. Descriptive literature containing full details can be had from JAS. H. MATTHEWS & CO., 3927 Forbes St., Pittsburgh 13, Pa.
Circle Inform-A-Gram No. A4.

The Portable PX-52 Metalmaster Disintegrator (inside cut) has been introduced. This model is complete, ready to use anywhere in your plant for tool and die repair, removal of taps, drill pulling, metal etching, etc. All that is necessary is to attach the electronic head into any drill press. WARNER DIVISION, Clinton Machine Co., 21535 Groesbeck Hwy., Detroit 5, Mich., will send an illustrated brochure.
Circle Inform-A-Gram No. A5.

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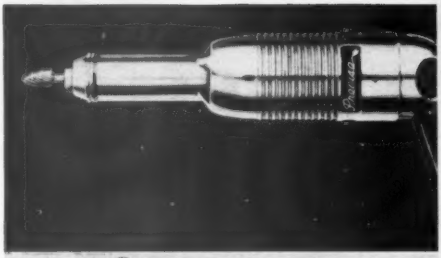
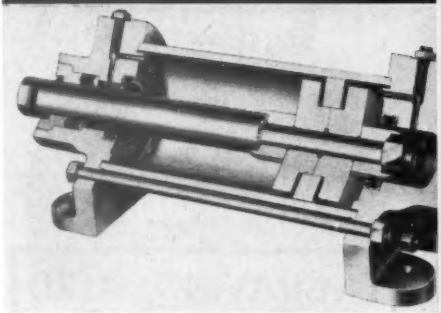
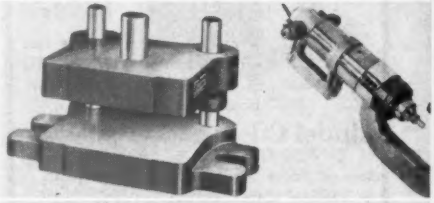
New Precise Super 40 Grinder-Miller is a multi-purpose, electrically powered unit for precision, high-speed application when set up in machine tool mounts on standard machine tools or when used as a portable hand tool with or without the attachable "Coolflex" flexible shaft. With extremely accurate quill and collet chuck, it turns at controllable speeds from 15,000 to 45,000 rpm. Folder F1 is offered by PRECISE PRODUCTS CO., 1341 Clark St., Racine 1, Wis.
Circle Inform-A-Gram No. A6.



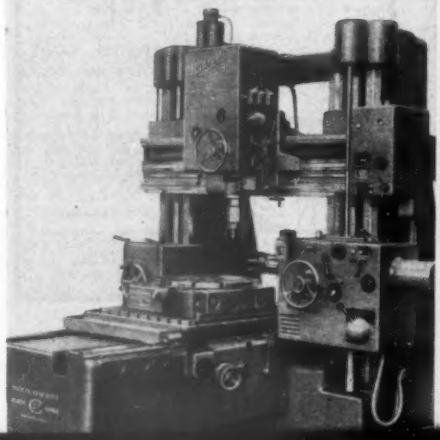
A Line of "Super-Cushion" Air Cylinders is now available from Tomkins-Johnson. It features application of flexible cushion sealing. Test results have shown that the T-J flexible cushion seal insures positive cushion action, combined with automatic valving action for fast return stroke. It also eliminates possible binding and sticking encountered in other methods where close metal fits are required to effect a seal. TOMKINS-JOHNSON CO., Dept. T&P, Jackson, Mich.
Circle Inform-A-Gram No. A7.



DIE-CO Standard Die Sets (inside cut) make up a new line just introduced. The announcement climaxes several years of intensive experimental engineering for manufacturing small, standard die sets to supplement The Die Supply Company's special die set service. Manufacturers, testing the new die sets in production, report exceptionally smooth, long-running operation. Revised DIE-CO Catalog No. 6 gives full details. THE DIE SUPPLY CO., 1400 Brookpark Rd., Cleveland 9, Ohio.
Circle Inform-A-Gram No. A8.

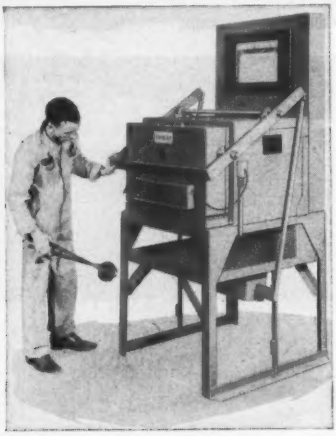


The Danly Portable Piercing Unit (outside cut) incorporates automatic hydraulic stripping action. Based on new hydraulic power cylinder designs, the unit is very compact and is completely hydraulic in action. The view is of a 45-lb., 5-ton capacity unit, stripper shown removed. Rigid construction and increased capacity permit piercing holes in some cases smaller in diameter than material thickness. DANLY MACHINE SPECIALTIES, INC., 2100 S. Laramie Ave., Chicago 50, Ill.
Circle Inform-A-Gram No. A9.



SIP Jig Boring and Milling Machines Hydroptic-7P and 8P feature viewing screens on which the graduation lines of the built-in standard scales are optically projected with a large magnification. These screens replace the former microscope eyepieces, thereby eliminating operator eye strain and thus speeding up settings. Address AMERICAN SIP CORP., 100 E. 42nd St., New York 17, N. Y., for additional data.
Circle Inform-A-Gram No. A10.

Cooley Type BL Electric Box Furnace is now being offered with a chamber size of 15" x 12" x 30". This new size extends the capacity of this type of furnace to handle greater production and larger units of work. The new furnace employs the Cooley embedded type of heating unit which protects the heavy element wire from atmospheric attack. Proper location of the elements assures maximum and uniform distribution of heat. Further information can be obtained by writing to COOLEY ELECTRIC MFG. CORP., 915 Daly St., Attn. H-2, Indianapolis 2, Ind.

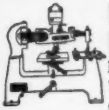


Circle Inform-A-Gram No. A11.

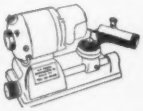
A New SPS Knock-Down Shop Stool is adjustable in three sizes to 15 positions and is designed to be shipped and stored economically. The six Hallowell stools shown are adjustable in 1" steps from 18" to 22" and actually fit into the two cartons pictured. Two other sizes are also available. The adjustment can be made simply with four small bolts. Complete details can be had from STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

Circle Inform-A-Gram No. A12.

ENGRAVING, ACID ETCHING, Electric MARKING — All can be done in this PREIS-PANTO UE MACHINE with simple attachments.



Model CG CUTTER GRINDER for single-lip Engraving & Routing Cutter Grinding.



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PREIS-PANTO CUTTERS and COLLETS. Single lip, straight or tapered.

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FOR MEASURING INSIDE, OUTSIDE, AND DEPTH.
3 GRADUATIONS 1/1000" — 1/128" 1/10 mm. IN BACK

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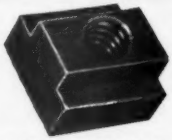

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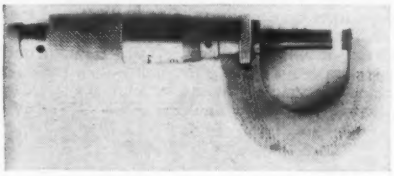
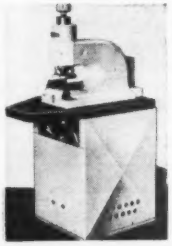
The MASTERMIKE Micrometer is guaranteed to be accurate within .00005" throughout its en-

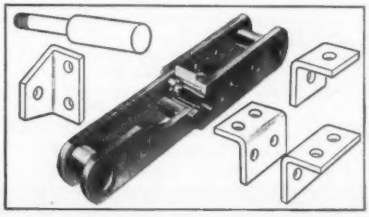


tire range. It is designed with a slightly oversize barrel, resulting in wider spacing of graduations than is normal, and consequent increase of ease and accuracy of reading. Full details can be had from the distributor, KARL A. NEISE, 381 Fourth Ave., New York 16, N. N. Y.
Circle Inform-A-Gram No. A13.



An Automatic Electric Piercing Press is now being sold by Dayton Rogers Mfg. Co. It is especially adaptable for piercing holes in fairly large parts, particularly where quantity requirements are limited. This press does not require any hand or foot levers to trip the machine, thus leaving the operator free to handle large parts with ease. DAYTON ROGERS MFG. CO., 2824 13th Ave. South, Minneapolis 7, Minn.
Circle Inform-A-Gram No. A14.

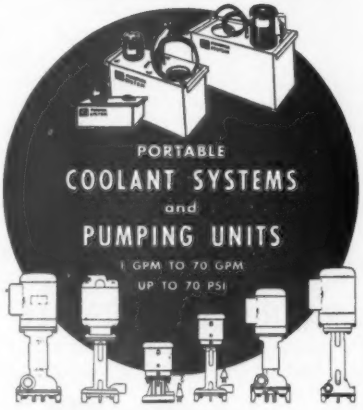
ACMOR Type HP (Hollow Pin) is a standard conveyor chain now available from stock in either a steel roller or bushing type in 2", 2½", 3" and 4" pitch. Stock attachments are obtainable for all pitches which are either bolted or welded to the chain proper, making it possible to construct an unlimited variety of conveyors from chain and attachments that can be carried



in stock. ACMOR CONVEYOR CHAIN CO., 17700 Broadway, Bedford, Ohio.
Circle Inform-A-Gram No. A15.

GET MORE PRODUCTION FROM YOUR MACHINES WITH —

GRAY-MILLS



PROPER application of coolants means increased production and time and tool savings. You can have these advantages for every machine—small, large, and special—with Graymills Portable Coolant Systems.

They can be installed in a few minutes, are modern in design, and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.

Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to ½ HP ratings, 1 gal. to 70 g.p.m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.

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GRAYMILLS CORPORATION
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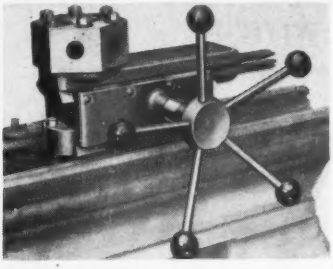
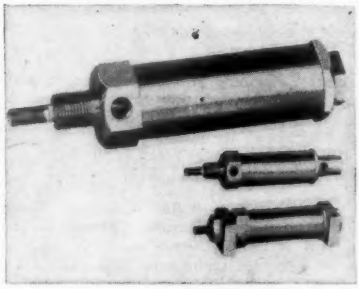
A Self-Indexing Bed Turret for use on most standard lathes swinging from 9" to 12" is announced by Globe Heat-Seal, Inc. It features a



sturdy, simple self-indexing mechanism that is linked to automatic stop rods. These limit stroke length and can be set for any requirement up to the full slide working stroke of 5¼". Total slide travel is 6". The turret is guided in its rotation by a large diameter pilot integrally cast which deeply engages a mating bearing in the slide. A new folder can be had from GLOBE HEAT-SEAL, INC., 3380 S. Robertson Blvd., Los Angeles 34, Calif.
Circle Inform-A-Gram No. A16.

"Web-Aire" Cylinder. Interchangeable mountings are the exclusive feature of this new cylinder, which is particularly adapted for jig, fixture and tooling operations to speed output. It is available with foot mounted and clevise mounted adapters. The basic unit and adapters are pictured. The unit has a threaded piston end, and steel head with interchangeable bronze bushings. "WEB-AIRE" PRODUCTS DIV.,



H. G. Weber & Co., Inc., Dept. T&P, Kiel, Wis., will supply details.
Circle Inform-A-Gram No. A17.

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SURFACE PLATES—ANGLE PLATES
PARALLELS—STRAIGHT EDGES

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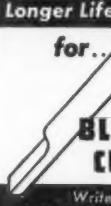

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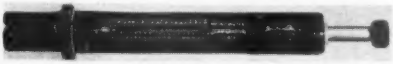
Write for Literature and Prices
EDWARD D. STRAND COMPANY
Box 54, West Side Sta., Worcester, Mass.

CHICAGO DIES
Complete Line of
PUNCHING and FORMING DIES
for All Sizes and Makes of
PRESS BRAKES
DREIS & KRUMP MANUFACTURING COMPANY
7428 S. Loomis Blvd., Chicago 36, Ill.

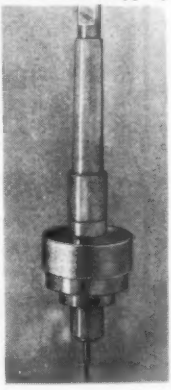
A Small, Powerful Inclinable Punch Press, designated No. 127, has been added to the Whitney-Jensen line. It is an open back machine that can be tilted 25°. The flywheel of the press is to the rear rather than at the side; the out-of-the-way location providing a greater margin of safety as well as more "elbow room" when feeding stock into the press. Catalog 16-52 contains full data. Write for a copy to the manufacturer, WHITNEY METAL TOOL CO., Dept. T&P, Rockford, Ill. **Circle Inform-A-Gram No. A18.**

Testing Surface Hardness of Non-Ferrous Material can be done with the pocket-size "on-the-job" instrument illustrated. It weighs less than 5 oz. and measures under 5" in length. Features include direct reading scales, one incorporating accurately correlated numerical equivalents of the Brinell 500 KG. 10 mm



Ball Testing Equipment and the Metalometer Scale. The latter is graduated numerically in 100 equal divisions and is to be used as a comparator for all accepted non-ferrous master specimens. PEABODY INDUSTRIES, Dept. 61, 12129 Hamilton Ave., Detroit 3, Mich. **Circle Inform-A-Gram No. A19.**

Super Sensitive Tapping Head. Embodying new principles of control, this Winslow Tapping Head is designed expressly for tapping 0-80 to 4-40 holes in steel or other material at high speed and with sensitive feel of the tapping operation. Control of the operation is through the knurled collar just above the tap. A light downward pressure applied to the collar drives the tap and a light upward pressure reverses it. WINSLOW PRODUCT ENGINEERING CORP., 5420 Jillson St., Los Angeles 22, Calif., can provide engineering specifications and literature. **Inform-A-Gram No. A20.**



Cut accidents — Increase man hour production with a . . . . . .

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Handles heavy dies from storage rack to press. Lifts barrels, boxes, loads trucks, makes a handy adjustable shop table. Automatic brake holds load at any height.

Type D — Hand operated
CAP. 500 lbs.....**$183.60**

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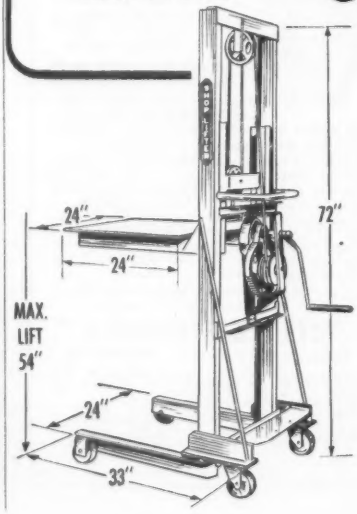
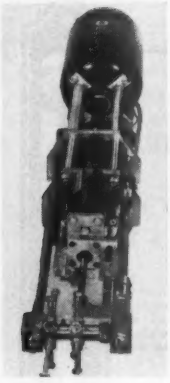


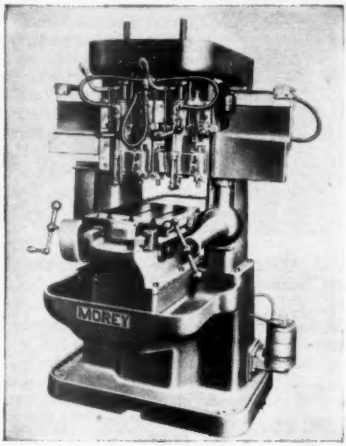
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS



A New Drilling Unit suited to a much wider than ordinary range of work is announced by Black Drill Co. It combines all the features of the standard traversing motor shaft type Black drilling unit with a 4" working travel and a skip stroke attachment, making it suitable for deep drilling, drilling in hard-to-get-at locations, and accurate drilling in materials requiring frequent chip clearing. It is designed to operate in any position. Air feed provides rapid, shockless advance to the work. Write to BLACK DRILL CO., 1368 E. 222nd St., Cleveland 17, Ohio, for more detailed information on this new drilling unit.

Circle Inform-A-Gram No. A21.

Morey's No. 12M High Speed Vertical Profiler & Miller has been redesigned. It is now equipped with improved spindle bearings. There are splined shafts in place of keyways, including the spindle. Other new features are hardened and ground steel ways on the cross-slide, while the travel-head is now mounted on rollers that ride on ball bearings to eliminate friction and assure quick, easy movement. For easier operation, the gear train has been



simplified and the control handle relocated. MOREY MACHINERY CO., INC., 410 Broome St., New York 13, N. Y.

Circle Inform-A-Gram No. A22.

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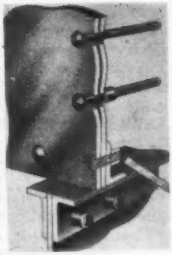
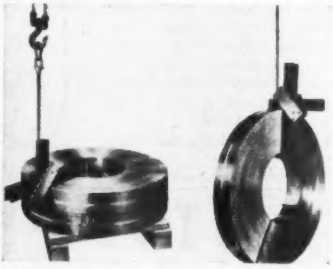


Lock Bolts are high strength, two-piece fasteners, consisting of a pin and a collar. The pin is inserted in the work from one side, and the collar slipped onto the pin from the opposite side. A special pneumatic tool installs the Lock Bolt. These Lock Bolts can be installed very rapidly. Address CHERRY RIVET CO., Div. of Townsend Co., Winston St. at Wall, Los Angeles, Calif.
Circle Inform-A-Gram No. A23.

One Operator using the Dixon Coil Grab can lift the coil from the pallet up to a vertical position in one easy motion. A prong tapered to fit between the coils, in the space made by the coil bands, is positioned while the opposite jaw is placed in the center of the coil. As the



crane lifts, the grab adjusts to the coil size and the tapered prong slides between the coils. As the coil lifts, the grab turns to allow the coil to move to a vertical position, locked by its own weight. DIXON RESEARCH, INC., 2304 23rd Ave., Rockford, Ill.
Circle Inform-A-Gram No. A24.

The "Pressure-Blast, Jr." is a bench model wet-blasting unit that has been recently redesigned. It now features the elimination of the usually troublesome pump—replacing the pump function by the siphoning action of the compressed-air operated jet gun. Used for deburring, descaling and general surface cleaning, the "Pressure-Blast, Jr." is easily installed. THE CROPLATE CO., INC., 747 Windsor St., Hartford 5, Conn.
Circle Inform-A-Gram No. A25.

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THE *JOHNSON 706* HARDENING, TEMPERING and ANNEALING FURNACE

Select any temperature you require from 300° to 1875° F. Get clean, uniform heat at low cost. The Johnson 706 is easily regulated. Six direct jet bunsen burners have separate valves and pilot lights. Firebox 7 x 13 x 16½ lined with high temperature refractory. Counterbalanced door opens upwards.

No. 706 Pedestal (illustrated) ---------$278.00
No. 706 Bench ---------$250.00

No. 654 with 5 x 7¾ x 13½ firebox:
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Bench ---------- $124.00

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JOHNSON GAS APPLIANCE CO.
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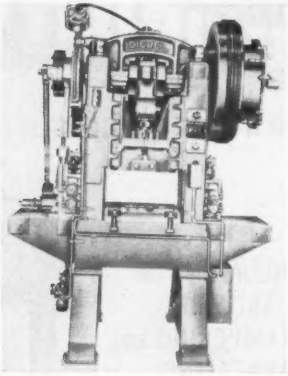
JOHNSON
FURNACES FOR INDUSTRY

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

The "DIEBEL DI-MATIC," a high production fully automatic press, has been developed by Di Machine Corp. This 40-ton press produces



intricate piece parts from the most complicated progressive dies because of its great rigidity which assures longer die life. An outstanding feature of this speedy model is the four main crankshaft bronze bearings which assure longer press life. The DI-MATIC also features an air-operated and electrically controlled friction clutch and brake; air ejector and cam; metered lubrication system; cylindrical slide 16" in diameter guided by adjustable retainers with 380 sq. in. of contact area. Write DI MACHINE CORP., 2708 W. Irving Park Rd., Chicago 18, Ill., for more details.

Circle Inform-A-Gram No. A26.

A Pocket-Size Continuity Tester has been added to the line of electricians' tools made by Ideal Industries, Inc. It is designed to determine continuity of circuits and to identify wires between terminals or in multi-wire cable, as in switchboards and control panels. It permits testing of circuits without the need of live wire connections, as it provides its own power from pen-lite batteries. This tester requires only one hand, leaving the other hand free to hold circuit diagrams or blueprints. For more data, write IDEAL INDUSTRIES, INC., 5186 Park Ave., Sycamore, Ill.

Circle Inform-A-Gram No. A27.

Precision Feeds For All Presses

- Easily installed on any press
- Can't slip. Reverse instantly
- Feed in thousandths
- Maintain original setting. No ratchets or pawls to wear down and affect feed spacing.

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Natural or Calcined Fuller's Earth 10-44 Mesh

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TAMMS INDUSTRIES, Inc.
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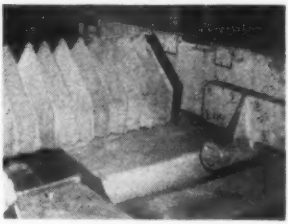
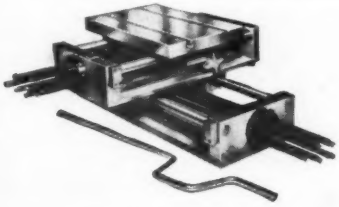
Milling Machine Way Protector. This accordion type protector prevents chips, dirt and abrasives from scoring, scratching, grooving



and cutting the ways. It can be mounted permanently and will fold automatically as work bed is moved in either direction. A & A MFG. CO., 2017 W. Clybourn St., Milwaukee 3, Wis., will furnish literature.
Circle Inform-A-Gram No. A28.

A Filter-Drain developed by C. A. Norgren Co. provides automatic removal of liquids and solids from compressed air lines, with automatic drainage of collected liquids. It operates, automatically, under constant or fluctuating air pressure and air flow. It also continues to operate when the flow of air is cut off. Full details can be had by writing to C. A. NORGREN CO., Dept. T&P, Englewood, Colo.
Inform-A-Gram No. A29.

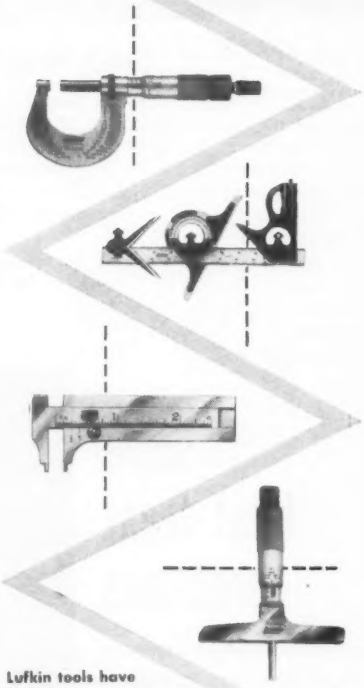
A Multi-Position Locating Device, the Speedi-Spacer, converts any upright or radial drill with an accurate spindle to a jig boring tool. Positive positioning is provided, and setup is exceptionally fast. Illustrated literature can be



obtained from QUEEN CITY MACHINE TOOL CO., 217 E. Second St., Cincinnati 2, Ohio.
Circle Inform-A-Gram No. A30.

the right tools for the craftsman

LUFKIN
PRECISION TOOLS



Lufkin tools have built-in accuracy that insures precision measurements. Specifically designed with many exclusive features that make them the right tools for craftsmen who demand the finest.

167-B

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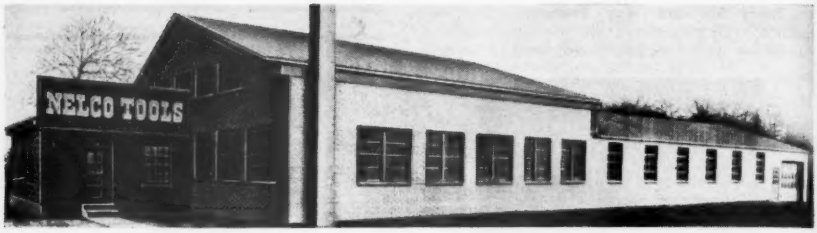
SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS



How's Your T. V. Interference

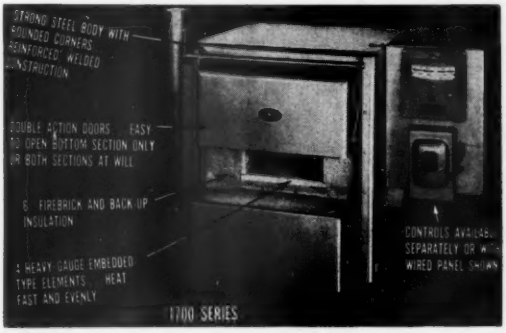
The above new plant represents a doubling of space utilized by the Nelco Tool Company of Manchester, Connecticut, in the fabrication of their line of standard, carbide-tipped cutting tools as well as tools specified for special carbide applications.

In addition to the latest in new carbide tool manufacturing equipment, of likely interest to industry is Nelco's new induction brazing room.

In the past, Nelco has experienced some difficulty with local T.V. viewers who have reported poor reception due to their receivers picking up interference from the carbide brazing operations. It is now felt that Nelco has arrived at an ingenious solution to the problem in the form of an electronic leak-proof room from which no disturbance can escape. If you have a similar problem, the Nelco Tool Company states they will be very happy to pass detailed information on to you.

solve heat-treat problems

with versatile Temco bench-type furnace


STRONG STEEL BODY WITH ROUNDED CORNERS REINFORCED WELDED CONSTRUCTION
DOUBLE ACTION DOORS EASY TO OPEN BOTTOM SECTION ONLY OR BOTH SECTIONS AT WILL
6" FIREBRICK AND BACK UP INSULATION
2 HEAVY GAUGE EMBEDDED TYPE ELEMENTS HEAT FAST AND EVENLY
CONTROLS AVAILABLE SEPARATELY OR WITH WIRED PANEL SHOWN
1700 SERIES

Step up production, cut costs with Temco electric furnaces for heat treating dies, parts, tools, etc. Model illustrated above one of eight convenient sizes available with either electronic or manual temperature controls. Economical, easy to install and operate, low cost. Priced from $55.00 to $507.50. Write for literature and nearest dealer's name.

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PRECISION BUILT
GEARS
1/8" TO 80" IN DIAMETER
Metallic and Non-Metallic
CUTTING ONLY OR COMPLETE GEARS

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HELICAL
WORMS
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RACKS, SECTORS
SPROCKETS
Since 1910

NOW MANUFACTURING FOR THE ARMED FORCES

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Machine Repair Parts • Breakdowns A Specialty • Round The Clock Service • Job, Production Machining and Gearing • Boring Mill Capacity To 80" • Over 400 Machines To Serve You • Ask For Our Equipment List; Catalog on Sprocket Gears and Chains.

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has been done with the SCLEROSCOPE
since 1907

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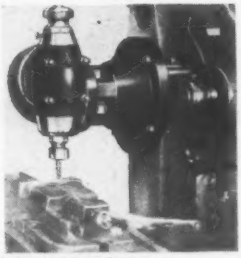
The BROWN Universal Vertical Heads Convert your HORIZONTAL into a VERTICAL Milling Machine

FOR TOOL WORK



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- High-Low milling feature.
- Powered by milling machine motor.
- Makes available all the machine spindle speed changes at the end mill.
- Five sizes—for machines from bench types to large floor models.
- Choice of 3 spindle types.
- Choice of universal or semi-universal.
- Available with overarm or cone type adapters.
- Compact and sturdy.

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HARDENED and GROUND HSS BLANKS

Any decimal diameter to 5/8" —in any length.
Mirror finish surface to gage tolerance. Many uses —
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Write or Phone ORange 3-4301 for price list D-3

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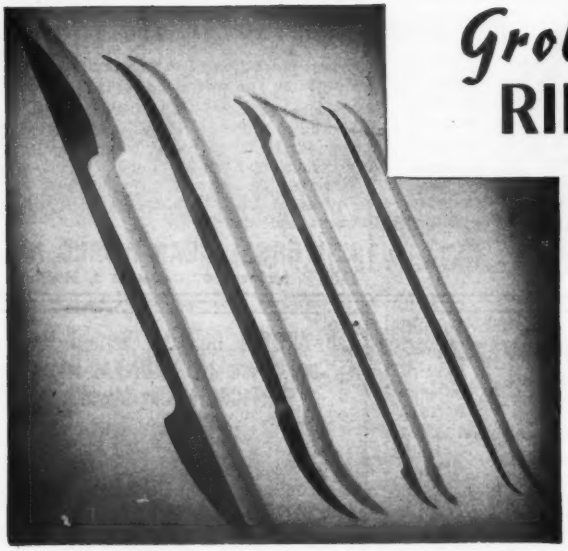

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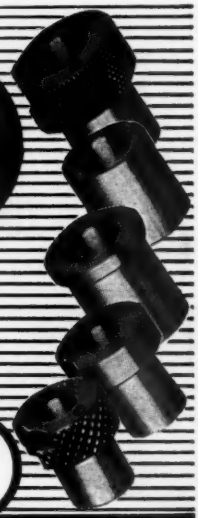

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Concentric

Acme Industrial Company
Makers of Hardened and Ground Precision Parts
206 N. Laflin Street — Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

. . . Machinability, from page 173

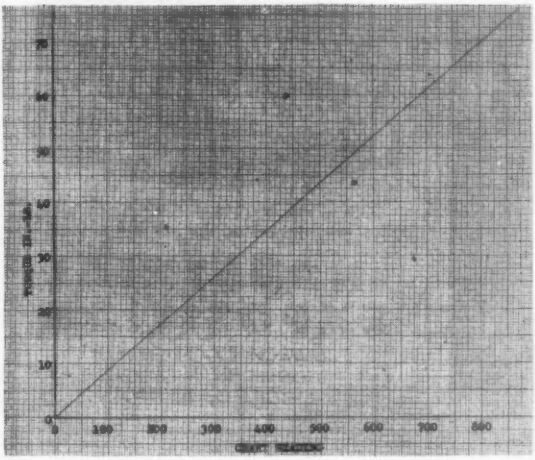
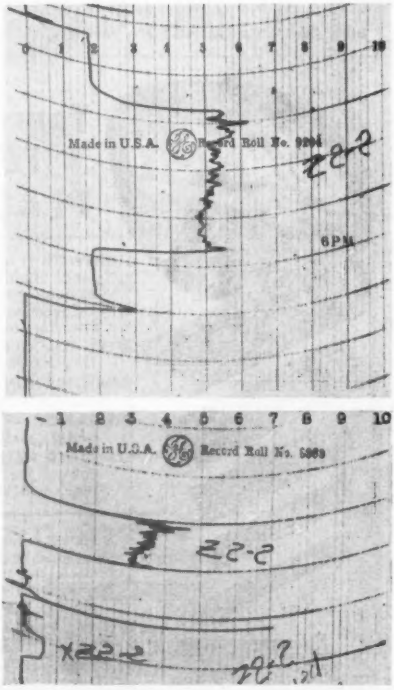


Fig. 6. (left) Power requirements for drilling are determined by two methods. The first is through the use of a recording watt meter connected to the motor terminals. The second, and independent, check on horsepower is provided by the torque table of Figure 5, page 61. At the left is a typical torque calibration curve.

Fig. 7. (below) The two recorder charts below give a comparison of the results obtained by measuring the drilling power by the motor watt meter (upper graph) and with the auxiliary torque table (lower graph).



variations which might arise from one test to another, the index material (AISI B1112 steel) is drilled during each test at the same settings of speed and pressure as used on the material under test.

2. To obtain more representative values and to detect variations in drill grinds, spotty materials, and similar influences which would produce erratic ratings, three or more holes are usually drilled in a distributed pattern in each specimen.

3. When a new material is encountered, a record of its hardness characteristics, microstructure, and physical and chemical properties is made for future reference.

4. Rolled or forged materials are drilled perpendicular to the direction of material flow, if possible. Cast materials are drilled in sections of dimensions similar to those which are to be machined, in order to isolate the influences of chilling or annealing in sections of varying thickness.

5. No coolant is used in the drilling tests, except in rare cases when a hole cannot otherwise be completed without breaking down the drill.

Test Factors and Calculations

Medium-carbon steel plate; Brinell hardness—120; Drill size—⅜ inch; Point angle—118 degrees; Speed—948 rpm; Ft/min—93; Thrust on drill—200 lb; Feed in

(Continued on page 224)

"Hi-Rockwell" Drills

DRILL, CLEAN, BRIGHT, ACCURATE HOLES IN

HARDENED STEELS

WITH A ROCKWELL HARDNESS OF C34 to C68
OUR FREE BOOKLET TELLS HOW

ALL DRILLS SHIPPED FROM STOCK

We also manufacture the NU-MIKRO piston grooving tool.

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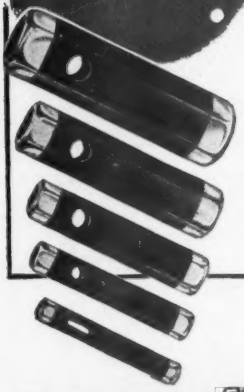

Your Production Load with FEDERAL TAPERLOCK PLASTIC GAGE HANDLES

LIGHTWEIGHT and DURABLE—FEDERAL Taperlock Plastic Gage Handles are *one-third lighter than aluminum!* Permits extremely sensitive "touch" necessary in close tolerance work. Lightness helps reduce fatigue from long, continuous use. Ideal for use by women inspectors.

IDEAL FOR GLASS GAGES—The light weight of FEDERAL Gages reduces danger of chipping and breaking if dropped.

IDENTIFICATION MARKING—Quickly done with the same stamps and tools used for marking handles of other materials.

INSULATION—Plastic possesses insulating properties that protect gages from bodily heat that might affect accuracy.

STANDARD SIZES—FOUR COLORS—Available in four standard colors: for quick identification—red, yellow, green and black—in seven (7) sizes: 00-0-1-2-3-4-5.

Made of durable plastic, FEDERAL Taperlock Gage Handles are tough and long-lasting. They do not mar or chip with severe use. Increase the efficiency of your production workers with FEDERAL Plastic Taperlock Gage Handles.

FEDERAL TOOL CORP
3606 W. Pratt Blvd. • Chicago 45, Illinois

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. . . Exhibitors, from page 127

The V & O Press Co.	
Div. of Emhart Mfg.	1331
Vapor Blast Mfg. Co.	1210, 1317
Versa-Mil Co.	1942
The Viking Tool Co.	650
Vlier Mfg. Co.	321
Vonnegut Moulder Corp.	400
M. Paul Wahlund Mechanical Lab.	543
Waldes Kohinoor, Inc.	751
Wales-Strippit Corp.	1412
Walker-Turner Div.	
Kearney & Trecker Corp.	1905
Ward Leonard Electric Co.	
Industrial Chrome Div.	139
Warner Div.	
Clinton Machine Co.	550
Waukesha Tool Co.	643
The Weatherhead Co.	351
Webber Appliance Co., Inc.	241
Webber Gage Co.	705
Wedco, Inc.	840
The Weldon Tool Co.	305
Wesson Co.	646
West Point Mfg. Co.	240
Wetmore Reamer Co.	747
Westinghouse Air Brake Co.	
Ind. Products Div.	1016
The Wickman Mfg. Co.	1105
Wiedemann Machine Co.	1915
Willey's Carbide Tool Co.	635
Wilson Mechanical Instrument Div.	
American Chain & Cable Co., Inc.	1126
Wilton Tool Mfg. Co.	237
Winter Engineering Corp.	840
N. A. Woodworth Co.	1323

ADDENDA

Columbia Enterprises, Inc.
Booth No. 341

On Display: The Columbia No. 2 vertical milling machine, a new, more versatile mill that incorporates the following features:

1. The knee is dovetailed into the body for greater rigidity. These dovetails are hand scraped for accurate vertical travel.

2. A draw bar type collet is now being used to hold the cutter. Has No. 2 Morse taper, and is a standard item.

3. It has a lower spindle speed selectivity. It is now possible to obtain speeds of from 51 through 1750 rpm.

4. Belt guard is heavier, designed for extreme safety.

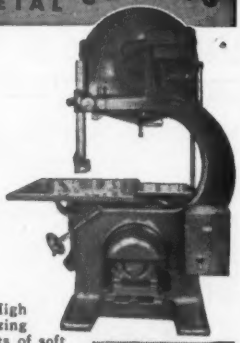
Viking Industries
Booth No. 1208

On Display: New bench-type precision surface grinder (illustrated), new small-sized magnetic chucks, and new, improved hydraulic Speed-Mills.

Cutting Hard-Tempered 1/8" Chrome Moley Steel

Sawing 16" Steel Piling

GREATEST COST SAVER IN METAL CUTTING



FRICTION sawing with Tannewitz High Speed Band Saws results in perfectly amazing time savings in the cutting of flat sheets of soft or hardened steels, non-ferrous metals, armor plate, glass, plastics, many other materials and the trimming of castings. For cutting formed parts there's nothing to compare with it. The down-drag of the saw is so negligible that parts may be trimmed or sawn as desired without using a rest of any kind. Whatever your cutting requirements, chances are they can be handled faster and at less cost with Tannewitz High Speed Band Saws.

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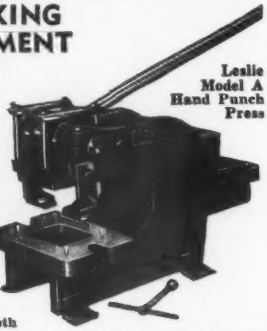
Well, consider these points:

- Capacity Up To 15 Tons
- Patented Leaf Provides Positive Punch and Die Alignment
- 6" Throat Depth
- Large Punch Plate and Bed Facilitate Blanking Over Big Areas



Leslie Model A Hand Punch Press

The Leslie Model A Press is the solution to your short run blanking problems.

Tool your jobs at low cost from our wide variety of standard punches and dies.

Diagram illustrates versatility of this Press—each blanking done with one stroke.

Write now for illustrated catalog and circular showing punches and dies.

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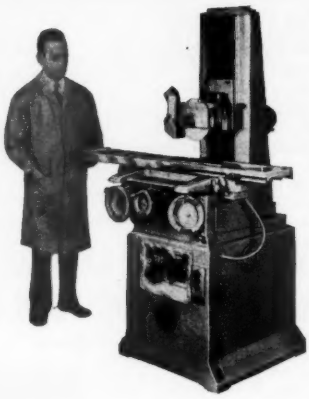

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WOODSON TOOL CO.
4811 LENNOX BLVD. INGLEWOOD, CALIF.

World's Fastest Cold Strip Steel Mill Drive

The world's fastest cold strip steel mill drive, designed to operate a five-stand tandem mill at top speed of 79½ miles per hour, is being built by the General Electric Company for the Fairless Works of the United States Steel Company.

This 21,650 hp drive is part on an order for G-E equipment for the giant new Pennsylvania plant. It is believed to be the largest single order placed for steel mill electric apparatus.

With a planned capacity of 1,800,000 ingot tons of steel a year, the Fairless Works will be the largest integrated steel-making installation to be built in less than two years time. It is being constructed on a 3800-acre plot on the Delaware River near Morrisville, Pa., and is expected to be in partial operation early this year.

Outstanding equipment for the vast plant will include not only the record-breaking cold strip mill drive, but also one of the world's fastest annealing lines (1000 fpm) and one of the largest annealing furnaces ever built—all supplied by G-E.

The five-stand cold strip mill will roll tinplate material 30 inches wide up to 7000 fpm. It will employ six G-E drives ranging from 1400 to 6000 hp. Each drive will be supplied with separate generators. The final stand will be the first ever to be driven by a twin-drive unit utilizing six armatures.

G-E will supply the furnace and complete motors and controls for the high-speed annealing line. The furnace, three stories high and 100 feet long, will have a record-smashing capacity of 30 tons an hour.

Use of amplidyne regulators for automatic control of tension, loop position and overspeeding will permit the 300-foot-long line to be operated by only a few men. The adjustable voltage system will serve more than 80 motors totaling 835 hp, and will be controlled by a panel 90 inches high and 92 feet long. Ac auxiliaries and the motor-generator set drive motors total more than 900 hp, requiring more than 100 lineal feet of group-assembled ac motor control.

Also to be supplied by G-E is the electric equipment for the world's fastest 80-inch, four-stand cold strip mill to operate at 3120 fpm. As in the five-stand mill, the main drive motors will total 21,650 hp, more than ever before utilized on a four-stand mill.

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WAR SURPLUS SAVINGS
Stationary or Portable ARC WELDER
97.50
Delivers 300 Amps., continuous — or 350 to 400 Amps., intermittent
Designed to weld continuously for hours . . . This unit is built around a rugged, heavy duty, aircraft type generator and comes complete with pulley reactor, output controls, switches and & rheostat mounted on sturdy steel frame. Operates on 15 H.P. for maximum output. Gas or electric motor. For light or heavy industrial work.
HYDRAULIC PUMP & CYLINDER SPECIALS
Hyd. Variable Displacement PUMP
Will deliver maximum volume at any pressure setting between 600 and 900 P.S.I. Pump housing serves as reservoir for system. Has built-in compressed air super-charger which makes system independent of outside atmospheric pressure. Rotation is left hand only. Maximum speed for continuous duty is 3750 R.P.M. Displacement is .484 cu. in. per revolution. or approximately 4 G.P.M. at 1750 R.P.M. 32.95
Special! HYDRAULIC CYLINDER
Gives 20,000 lbs. thrust (push or pull) using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lbs. thrust with 3000 PSI. Can also be used on low pressure air systems. 4" bore; 18" stroke; 30½" length. Ideal for roadform — shop machinery, etc.
29.95
P-3 STRATO POWER PUMP
With built-in variable flow control valve in head. Positive displacement piston type. Displacement capacity: 2 gal. per min. at 1500 RPM at 1250 PSI. Pressure limit 1250 PSI continuous. 1400 PSI for 15 sec. Operates at 3750 RPM, intermittent max. 4500 RPM. Rotates either direction without adjustment . . 19.50
No. 3 HYDRAULIC CYLINDER
Double action. Bore is 1" — Shaft ½". Has stroke of 2½" to 4". Stroke can be adjusted with internal sleeve stops. Overall length is 8½". Will take 1500 lbs. continuous duty. 3000 lbs. intermittent. Will lift or push up to 1100 lbs.
5.75
P-4 VICKERS ANGLE PUMP
Positive displacement type, angle piston. Displaces .507 cu. in. per revolution. Has capacity of 6 gal. per min. at 3000 RPM at 1500 PSI., continuous. 1875 for 15 sec. Operating speed of 3750 RPM, intermittent maximum, 4500 RPM. Rotates to the right only.
19.49
FOUR WAY VALVE
Poppet type. Pressure balanced. Oil at neutral position. Piston type with built-in relief valves for limit of cylinder strokes. 5/8" AN tube size (7/8"—14 thread) inlet & outlet. Parts to cylinder are 1/2" AN tube size 3/4"—16 thread).
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GLENDALE 1, CALIF.
Order from this ad. All sales final. All prices F.O.B., Glendale. Pay by M.O. or check. P.O.'s accepted from D&B. firms. ½ deposit with C.O.D.'s.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

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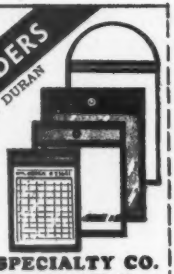
A DEFENSE "MUST"



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More Steel Made Available

An additional 75 million pounds of chromium stainless steel in all forms except tubing have been made available for shipment to fabricators in the first quarter of 1952, the Defense Production Administration has announced.

Although no relief is in sight in nickel-bearing stainless steels, DPA said, many manufacturers who have preferred nickel-bearing stainless steel can make most products by using straight chromium stainless steel.

DPA said release of this tonnage will relieve pressure on copper, nickel, brass and zinc wherever fabricators are willing to substitute it for these metals.

• HIGH SPEED GRINDING •

STANDARD D-4 ABRASIVE BAND GRINDER

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit!

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the new miracle grinding wheel bond

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CHICAGO WHEEL & Mfg. Co.

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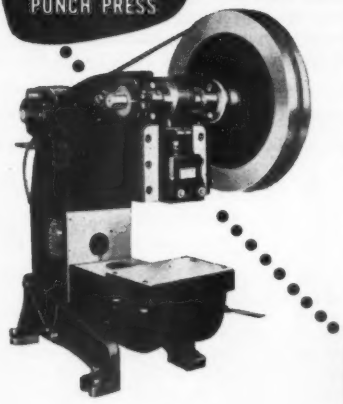
KENCO
5-TON
VARI-SPEED
PUNCH PRESS



more quality for your money

- More "Big Press" Features...check 'em!
- Offering *Vari-Speed* in the Small Press Field
- Competitively Priced

You bet there's more quality... Kenco crankshafts are one-piece construction of alloy steel heat-treated and precision ground. The clutch collar contains the clutch drive dog . . . this eliminates dog breakage. Self-locking wedge assures single or continuous trip—can't double trip. Extra-heavy balanced flywheel gives carry-through stroke on slow as well as high speeds. Adjustable V-belt sheave gives speed changes with one adjustment.

Heavy-duty, extra long V-type ram guides are hardened and ground. Has a wider frame. Its companion drive is pinned to flywheel and will shear off under excessive overload. Write for details on all 6 models of Kenco Power Presses.

KENCO MANUFACTURING CO.
5211 Anaheim-Telegraph Rd. Los Angeles 22, Calif.

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is a MUST *for all* PRECISION WORK

A COMPREHENSIVE
SET OF MEASURING
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— Simple in construction, reasonable in price, and fully reliable for unerring accuracy and wherever possible independent of the human element of "feel".

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COMPLETE LINE OF PRECISION INSTRUMENTS
200-T LAFAYETTE ST. • NEW YORK 12, N.Y.

SEE ADVERTISERS INDEX, PAGE 153, FOR KEY NUMBERS

. . . Machinability, from page 217

inches per minute—2.26; Feed in inches per revolution — 0.0024; Metal removal rate in cubic inches per minute—0.250; Machinability rating in percent—63

Calculation of Drill Press Machinability Rating

The following is typical of the manner in which machinability data is recorded:

	Test Material	Index Material
	Medium-carbon steel plate	AISI B1112
Drill Diameter	⅜ inch	⅜ inch
Drill Speed	948 rpm	948 rpm
Feed Pressure	200 lb	200 lb
Timed Depth	1 inch	1 inch
Time Interval	26.5 seconds	16.7 seconds

From this information, the indicated machinability rating of the medium-carbon material would be determined in the following manner:

$$\text{Medium-carbon Machinability Rating} = \frac{\text{Time to drill AISI B1112}}{\text{Time to drill medium-carbon steel}} = \frac{16.7}{26.5} = 0.63$$

Application of Machinability Ratings

As an example of the application of machinability ratings, suppose that machining practices have indicated that the index material, AISI B1112 steel, can be machined satisfactorily at 130 feet per minute. It is desired to determine the machine speed for an operation involving medium-carbon steel plate:

Machining Speed =

Index Speed x Factor =

130 x 0.63 =

82 feet per minute (approx)

It is again emphasized that the use of the machinability factor in computing speed produces only a guide speed which may have to be adjusted upward or downward for the condition of the material, the particular tools and equipment used to machine it, and the manner in which they must be used.

Because of the limited combinations of feed and speed which are available on most machine tools, it is common practice to use a combination of feed and speed which is equivalent to the product of the recommended feed times the speed for the index material times the machinability factor of the material being machined. Thus, if the nearest available speed is below the speed indicated for the material, then the next higher feed might be used to obtain an equivalent yield. Likewise, if the nearest available speed is slightly higher, a lower feed might be used. However, reasonable judgment must be exercised when attempting equivalent combinations, in order to avoid excessive tool burning or breakage.

. . . From page 116

A.S.T.E. Annual Meeting

Chicago, Illinois • March 17-21, 1952

PLANT TOURS—cont'd.

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Scully-Jones and Company
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Friday, March 21, 1952

(9:00 A.M. from Conrad Hilton Hotel)

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Clearing Machine Corporation
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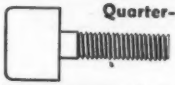

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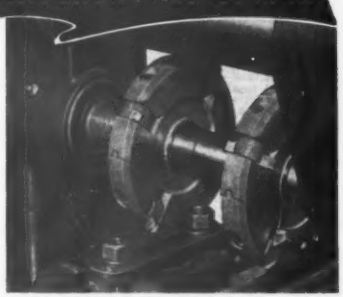

Above: STRADDLE MILLING

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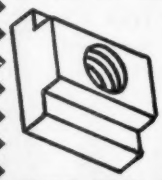

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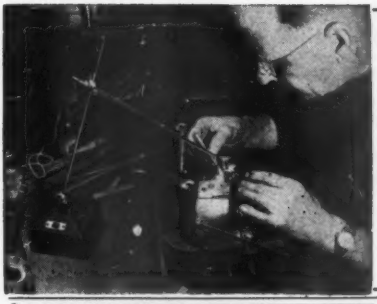

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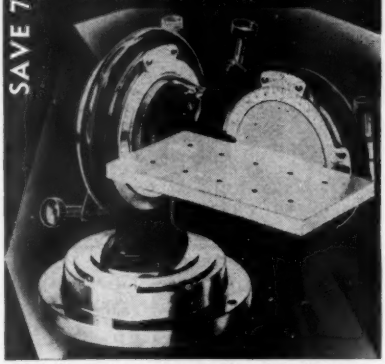

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17/64	12	9	2.05
9/32	12	9	2.05
19/64	12	9	$2.25
5/16	12	9	2.25
21/64	12	9	2.50
11/32	12	9	2.50
23/64	12	9	2.75
3/8	12	9	2.75
25/64	12	9	3.05
13/32	12	9	3.05
27/64	12	9	3.30
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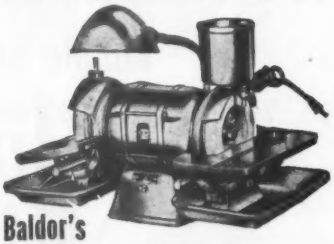

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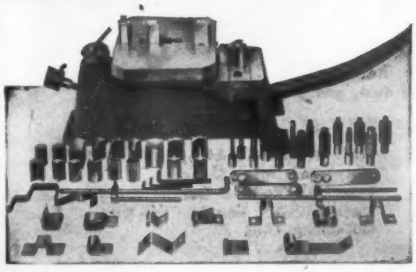

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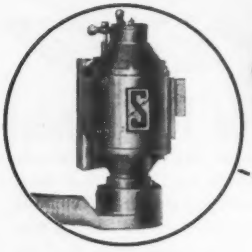

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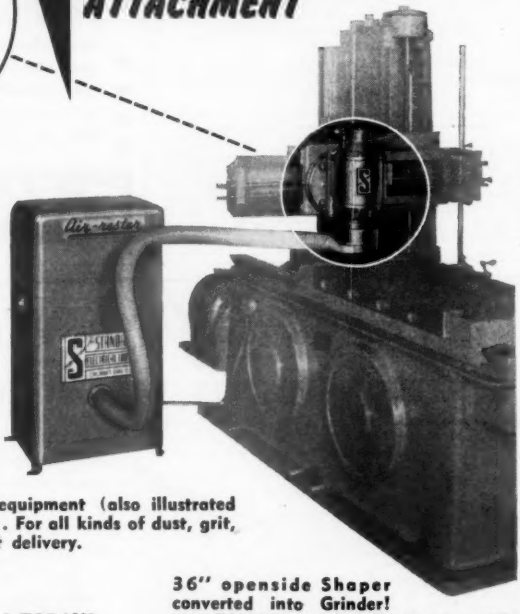

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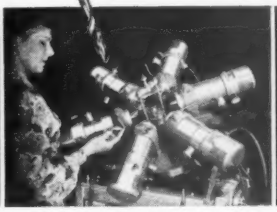

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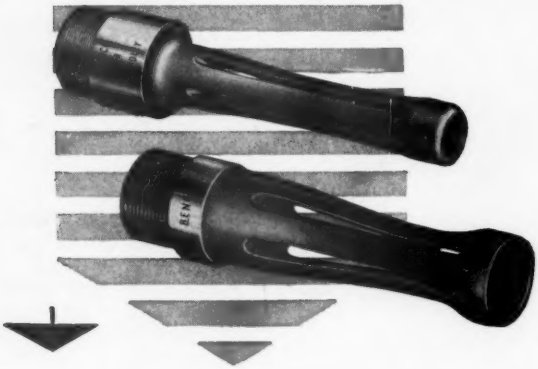

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